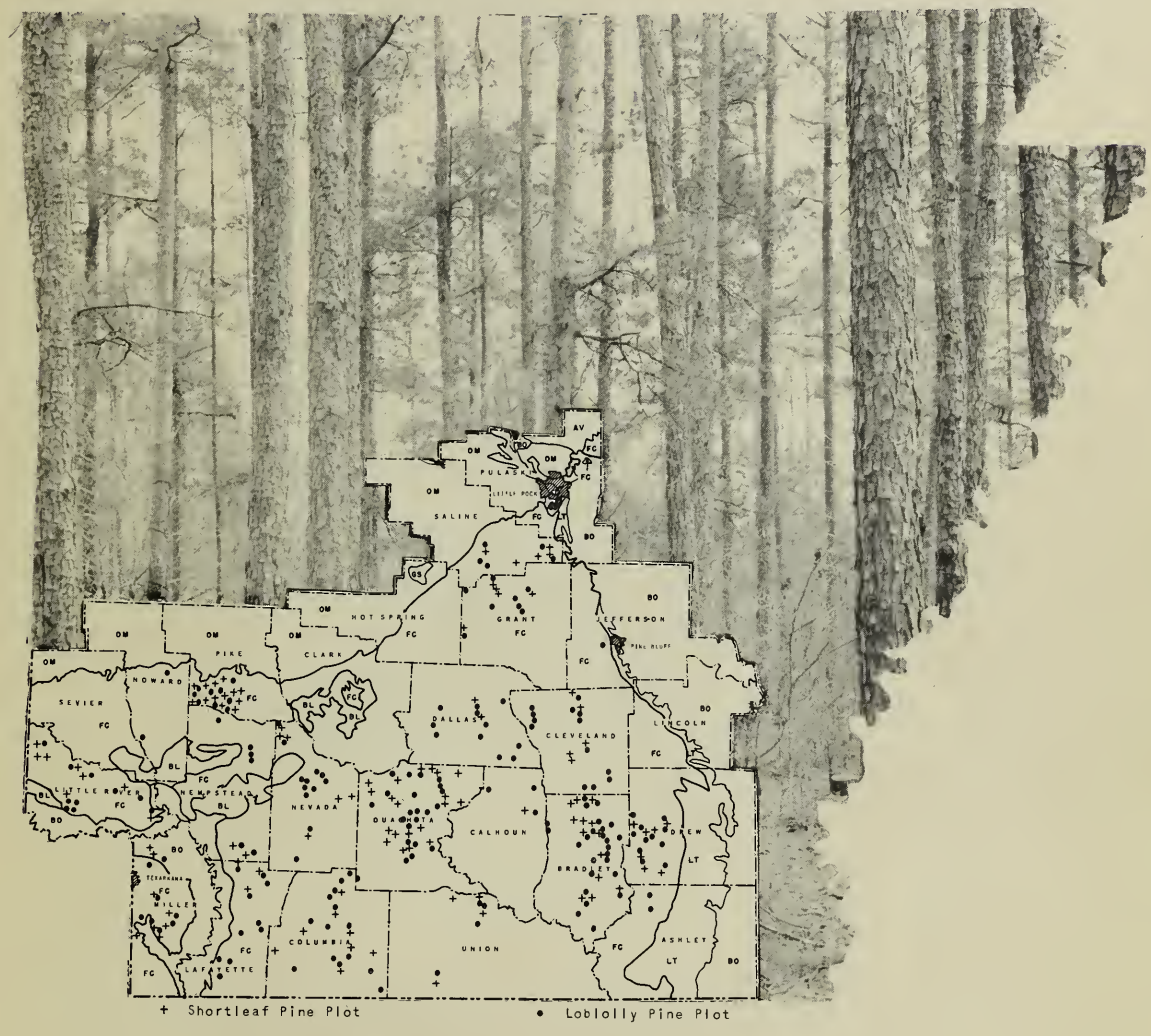
SOIL SURVEY INTERPRETATIONS FOR WOODLAND CONSERVATION

Forested Coastal Plain ... Arkansas

Progress Report



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Soil Survey Interpretations For Woodland Conservation

FORESTED COASTAL PLAIN ..... ARKANSAS
Progress Report

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CONTENTS

SOIL SURVEY INTERPRETATIONS FOR WOODLAND CONSERVATION -- FORESTED COASTAL PLAIN, ARKANSAS, PROGRESS REPORT

Introduction

This report is an interpretation of soil surveys for woodland conservation in the Forested Coastal Plain Area of Arkansas. The purpose is to provide--to foresters, agricultural workers, and woodland owners--currently available knowledge about soils as they relate to woodland conservation.

In the Forested Coastal Plain of Arkansas, soil surveys have been made by the Soil Conservation Service since 1935. At the present time, approximately 3,900,000 acres, or 54 percent, of the area has some kind of a soil survey. Most of these can be interpreted into woodland suitability groupings by use of the soil-woodland data and information presented in this report.

Interpretations of soil survey information are an integral and essential part of the Service's responsibilities. The full utilization of basic soils information provided by the Soil Survey is dependent upon adequate interpretations. These are provided by the joint efforts of the soil scientists, woodland conservationists, agronomists, engineers and others. In making these interpretations the primary objective is to give them utility in an operations program.

Relating site index, the height of dominant and codominant trees at age 50 years, for a selected tree species to the kind of soil is an initial step in providing interpretations of soil survey data for woodland conservation planning. This relationship is basic to considerations of land-use adjustments and the application of woodland conservation practices on established woodlands. The specific suitability of a particular soil for growing any crop is largely dependent upon its ability to grow that crop in a quantity and of such quality to attract the necessary management inputs. This is particularly true of wood crops due to the time required for crop maturity and the quantity of growing stock required for full production. The use of soil surveys is facilitated by grouping soils with similar productive potential and with similar kinds of responses to conservation treatments.

Soil-woodland data and the interpretations presented in this report provide a method of determining those soils that might well be given the highest use priority in the production of wood crops. In addition to the rating of productive potential, soils are also grouped according to limitations and hazards for the production of wood crops. These groupings aid in relating woodland conservation practices, such as thinning, weeding, direct seeding, planting, etc., to soil mapping units.

Description of Area

The Forested Coastal Plain Area of Arkansas comprises about one-fifth of the State ($7\frac{1}{4}$ million acres) and lies in the southwestern corner (Figure 1). The past and present land use and current forest cover types found in the area, the geology, soils, climate and topography are discussed briefly in the following paragraphs.

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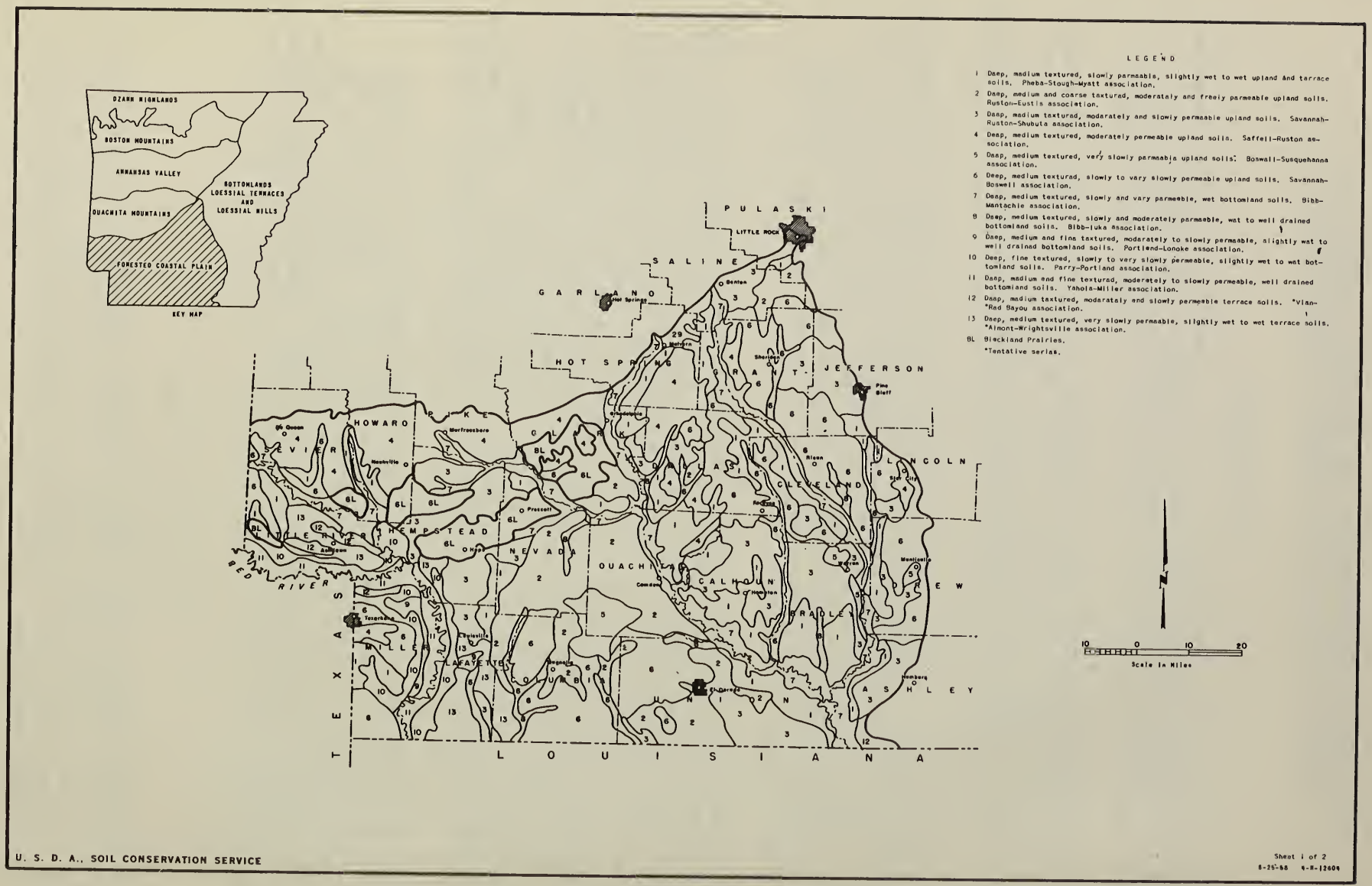

Figure 1. Soil associations of Forested Coastal Plain, state of Arkansas. (From State Soil Association Map – Arkansas, prepared by Soil Conservation Service in cooperation with Arkansas Agricultural Experiment Station and being published in cooperation with Arkansas Extension Service.)

DESCRIPTION OF SOIL ASSOCIATIONS IN FORESTED COASTAL PLAINS IN ARKANSAS

1. Deep, medium textured, slowly permeable, slightly wet to wet upland soils. Pheba-Stough-Myatt Association.
This association occupies nearly level to gently sloping typical "flat woods" of the Forested Coastal Plain. The major soils are the Pheba and Stough series in better-drained areas and Myatt series in more poorly-drained areas. The Pheba and Stough soils have grayish brown silt loam or fine sandy loam surfaces and mottled yellowish brown and gray sandy clay loam subsoils. The Myatt soils have gray silt loam or fine sandy loam surfaces and gray sandy clay loam subsoils. These areas are used chiefly for the growth of loblolly and shortleaf pine. Associated soils include Savannah, Ora, Prentiss, Tilden, Leaf, Izagora, Kalmia, and Caddo.

2. Deep, medium and coarse textured, moderately and freely permeable upland soils. Ruston-Eustis Association.
This association is on moderately sloping sandy lands. The major soils are the Ruston and Eustis series which occur on all ridge and slope aspects. Ruston soils are grayish brown sandy loams over yellowish red sandy clay loams. Eustis soils are loose brown and yellowish red loamy fine sand to a depth of 30 inches or more, over red sandy loam. These soils are used for general farming and for forestry. Associated soils include Norfolk, Saffell, Orangeburg, Lakeland and Shubuta.

3. Deep, medium textured, moderately and slowly permeable upland soils. Savannah-Ruston-Shubuta Association.
This association occupies nearly level to gently sloping areas. The major soils are the Savannah series in the nearly level areas and Ruston and Shubuta series in the more sloping areas. Savannah soils have grayish brown silt loam or fine sandy loam surfaces and mottled gray, yellow and brown sandy clay loam subsoils. Ruston soils have grayish brown sandy loam surface soils and yellowish red sandy clay loam subsoils. Shubuta soils have grayish brown fine sandy loam surfaces and red sandy clay subsoils. Chief uses for these soils are for growth of pine timber and general upland farming. Associated soils include Boswell, Ora, Sawyer and Bowie.

4. Deep, medium textured, moderately permeable upland soils. Saffell-Ruston Association.
This association occurs on gently to moderately sloping land on which the ridges and slopes are relatively narrow. Saffel soils have brown gravelly fine sandy loam surfaces and reddish brown gravelly sandy clay loam subsoils. Ruston soils have grayish brown sandy loam surfaces and yellowish red sandy clay loam subsoils. These soils have been used in the past principally for cotton and other row crops and many areas are still used for those crops. Some areas have been planted in pine seedlings in recent years. Numerous gravel pits have been located on Saffell soils. Associated soils include Boswell, Sawyer, *Dierks and *Paraloma.

5. Deep, medium textured, very slowly permeable upland soils. Boswell-Susquehanna Association.
This association occurs chiefly on gently to moderately sloping areas. The slopes are typically short. Boswell soils have brownish gray fine sandy loam surfaces and red heavy clay subsoils. Susquehanna soils have brownish gray fine sandy loam surfaces and mottled red, gray and yellow heavy clay subsoils. Chief uses of these soils are pasture grasses and pine trees. Associated soils include Shubuta, Savannah and Cuthbert.

6. Deep, medium textured, slowly to very slowly permeable upland soils. Savannah-Boswell-Shubuta Association.
This association occupies nearly level to moderately sloping land. The major soils are the Savannah series in the nearly level and gently sloping areas and Boswell and Shubuta series in the steeper areas. Savannah soils have grayish brown silt loam or fine sandy loam surfaces and mottled gray, yellow and brown sandy clay loam subsoils Boswell soils have brownish gray fine sandy loam surfaces and red heavy clay subsoils. Shubuta soils have grayish brown fine sandy loam surfaces and red sandy clay subsoils. This association is used extensively for cotton, corn and other row crops, as well as for pasture and pine. Associated soils include Ruston, Sawyer, Eustis, Norfolk, Susquehanna and Pheba.

7. Deep, medium textured, slowly and very permeable, wet bottomland soils. Bibb-Mantachie Association.
This association occurs in the present stream flood plains. Most areas are subject to stream flooding. The major soils are the Bibb series in the poorly-drained areas and Mantachie series in slightly better-drained areas. Bibb soils have light gray fine sandy loam surfaces and gray sandy clay loam subsoils. Mantachie soils have yellowish brown fine sandy loam surfaces and light gray sandy clay loam subsoils. Most of this area is in bottomland hardwoods. Associated soils include Iuka and Ochlockonee.

8. Deep, medium textured, slowly and moderately permeable, wet to well drained bottomland soils. Bibb-Iuka Association.
This association occurs on the streams that have sediment sources in the Forested Coastal Plains and carry little or no sediments from any other major soil area. This is level to nearly level land. Bibb soils occupy the lower wetter areas and Iuka soils are on the higher moderately well drained portions of the present flood plains. Bibb soils have gray fine sandy loam surface soils and yellowish brown sandy loam subsoils. The higher areas are used largely for cotton, corn, hay crops and pasture grasses. The lower areas are in hardwood trees. Associated soils are Ochlockonee and Mantachie.

9. Deep, medium and fine textured, moderately to slowly permeable, slightly wet to well drained bottomland soils. Portland-Lonoke Association.
This association occupies a nearly level portion between the backwater deposits and natural levees on higher flood plains along the Red River. Portland Soils have brown clay surfaces or may have silt or sandy loam overwashes. The subsoils are yellowish brown and reddish brown clays. Lonoke soils are dark brown silt loams over brown silty clay loams. This association is used for cotton, soybeans, corn and hay crops. Associated soils include Perry and *Gallion.

10. Deep, fine textured, slowly to very slowly permeable, slightly wet to wet bottomland soils. Perry-Portland Association.
These are the chief "backwater deposit" soils occurring along the Red River. They occupy level to concave surfaces. Perry soils have very dark brown clay surfaces and dark gray to gray mottled clay subsoils. Portland soils have brown clay surfaces or silt or sandy loam overwashes. The subsoils are yellowish brown and reddish brown clays. Where drainage facilities are not installed, these soils are still in bottomland hardwoods. Areas that have been drained are used for rice, cotton and soybeans. Associated soils include Yahola and Miller.

11. Deep, medium and fine textured, moderately to slowly permeable, well drained bottomland soils. Yahola-Miller Association.
This association occupies nearly level to gently undulating land on the present stream flood plains. Yahola soils have reddish brown fine sandy loam surfaces and reddish brown strata of sandy, silt and clay loams. Miller soils are crumbly reddish brown clays. These soils are used for cotton, soybeans, corn and alfalfa. Associated soils include Perry, Portland and *Gallion.

12. Deep, medium textured, moderately and slowly permeable terrace soils. *Vian-*Red Bayou Association.
This association occupies stream terraces or benches along the Red and Ouachita Rivers. This is gently sloping land. *Vian soils have grayish brown fine sandy loam surfaces and yellowish brown or brown sandy clay loam subsoils. *Red Bayou soils have grayish brown fine sandy loam surfaces and mottled red, yellow and gray sandy clay subsoils. These soils are used for general farming. In some areas the soils are used intensively for berries and vegetables. Associated soils include *Leshe, Morse, Hortman, Dougherty and Stidham.

13. Deep, medium textured, very slowly permeable, slightly wet to wet terrrace soils. *Almont-Wrightsville Association.
This association occupies the level, more poorly drained portions of the stream terraces or benches, chiefly along the Red River. *Almont soils have light yellowish brown silt loam surfaces and mottled gray, red, brown and yellow clay. Wrightsville soils have light gray silt loam surfaces and mottled gray, yellow and red clay subsoil. This association is used for pasture grasses and mixed pine and hardwoods. Associated soils include Muskogee, *Red Bayou and *Vian.

*Tentative Series

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The first major settlement of the Forested Coastal Plain Area in Arkansas was prior to 1817. The early settlers came into this region from Kentucky, Tennessee and the Carolinas. They settled mostly along the Saline, Ouachita and Red Rivers and other major streams. Their first interest was that of hunting game. Farming operations became of greater interest about 1840 when the hunters moved on to wilder areas and more devoted settlers came into the area. Lumbering operations began about 1850.

In the early 1900's, cotton and lumber became the leading crops. Now, the principal cultivated crops are cotton, corn, soybeans, hay and truck crops such as tomatoes, cucumbers, watermelons and cantaloupes. Peaches are grown extensively in a few counties in the western portion of the area. It is estimated that the maximum acreage of cultivated land was reached some time prior to 1940. Some 35 per cent (about $2\frac{1}{2}$ million acres) of the area was cropland and pasture land with the remainder primarily woodlands. Approximately 71 per cent of the southwest area of Arkansas is forested (USDA Forest Service, 1956 (9)). Applying this percentage to the total area of the Forested Coastal Plain, there are about 5,150,000 acres in forest.

Shortleaf and loblolly pines, usually in mixtures with upland hardwoods, are found on about 60 per cent of the forested area. Loblolly pine occurs more abundantly in the southern part of the area. Upland hardwood associations occur locally. Bottomland hardwoods occur extensively along the main rivers and local streams. The principal forest cover types in the area are shortleaf pine, shortleaf pine-oak, loblolly pine, loblolly pine-shortleaf pine, loblolly pine-hardwood, sweetgum-Nuttall oak-willow oak, and swamp chestnut oak-cherrybark oak (Society of American Foresters, 1954 (4)). Much of the woodland has been cut very heavily. A few uncut areas remain.

At the present time, a large acreage of land is being planted to loblolly and shortleaf pine. More than 40,000 acres were planted with approximately 32 million trees during the fiscal year of 1958 by Soil Conservation District cooperators. A large portion of this acreage was once cultivated land.

Recent agricultural programs of Federal and State agencies have contributed to the large increase in tree planting. Prior to 1948 wood-using industries did most of the tree planting. Since that date the interest of farmers and small landowners (under 5,000 acres) has increased to a point where most tree planting is now carried on by them. Farmers now recognize tree farming as a new practice in agriculture. The gradual rise in timber prices and the establishment of pulpwood markets have been largely responsible for the increased interest of farmers and small woods owners in tree farming.

It is generally accepted by geologists that after the Ouachita and the Ozark regions had emerged from the sea, the southeastern portion of the State, Forested Coastal Plain, underwent several sequences of inundation and emergence. Materials of the adjacent uplands were washed into the area by the major streams. When the Gulf water receded, the material that had been sorted into deposits of different sized particles and composition was left as a southward sloping plain. The geologic material consists largely of unconsolidated or weakly cemented sands and clays, and some chalk and marl.

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Recent, Pleistocene, Tertiary, and Cretaceous geologic ages are represented. The drainage pattern is made up of master streams flowing southward, and tributaries which dissect the plain between the larger streams. Alluvial plains on the larger streams range up to 10 or 15 miles in width and consist of recent deposits and several levels of Pleistocene terraces.

The major soil associations, their general pattern, relative extent and description are shown in Figure 1. They include soils falling into the zonal group of Red and Yellow podsolic soils. They occupy the ridges and slopes of the coastal plain uplands and are sometimes found on terraces and level areas. The soils have developed under a forest cover, mostly pine. They are generally sandy, derived from unconsolidated sands and clay. The yellow soils predominate with the red soils occurring in relatively small areas throughout this major soil area. Normally they have a very thin organic layer over yellowish brown, heavily leached soil which rests on beds of sand, silt or clay. These soils have subsoils distinctly different from the surface soils. Some of the level terrace and bottomland soils have a low degree of horizon development and are known as "azonal" soils.

Topography varies from level to rolling. Most level areas occur adjacent to streams and drainage ways and in the so-called "flat woods" of the uplands. The more rolling topography is found generally along the breaks between upland and alluvial areas.

The climate of this area is characterized by long, warm summers and short, moderately cold winters. Growing season (number of frost-free days) varies from about 217 days in Grant County in the northern portion of the area to about 240 days in Union County in the southern portion along the Arkansas-Louisiana State line (Figure 2). The annual rainfall varies from 42 inches in the western part to 53 inches in the eastern part of the area (Figure 3). The rainfall during the growing season for pine (March through October) ranges from 29 inches in the western part to 33 inches in the eastern portion of the area.

Previous Related Work

A number of studies have been reported, especially during the past ten years, showing the relationships between soils and the growth of trees. Some of these studies apply directly to the species and area included in the present report. No attempt is made to give a complete literature review. Readers are referred to the original papers summarized below for this information and to still more complete literature sources that are referenced in them.

Turner (5) (6) (7) studied 222 one-quarter and one-half acre plots in shortleaf and loblolly pine stands located in Ashley, Columbia, Howard, and Bradley Counties, Arkansas. These counties sampled the Forested Coastal Plain Area. He determined site index and rate of volume growth on 22 soil types and has presented detailed information. The results are discussed by site quality groupings of soils - six site classes being recognized for loblolly (site index values of 110, 100, 90, 80, 70, 60) and four for shortleaf pine (90, 80, 70, 60). Some excellent ecological and silvicultural comments are given for the soils in each site class that should be helpful in devising better woodland conservation practice specifications.

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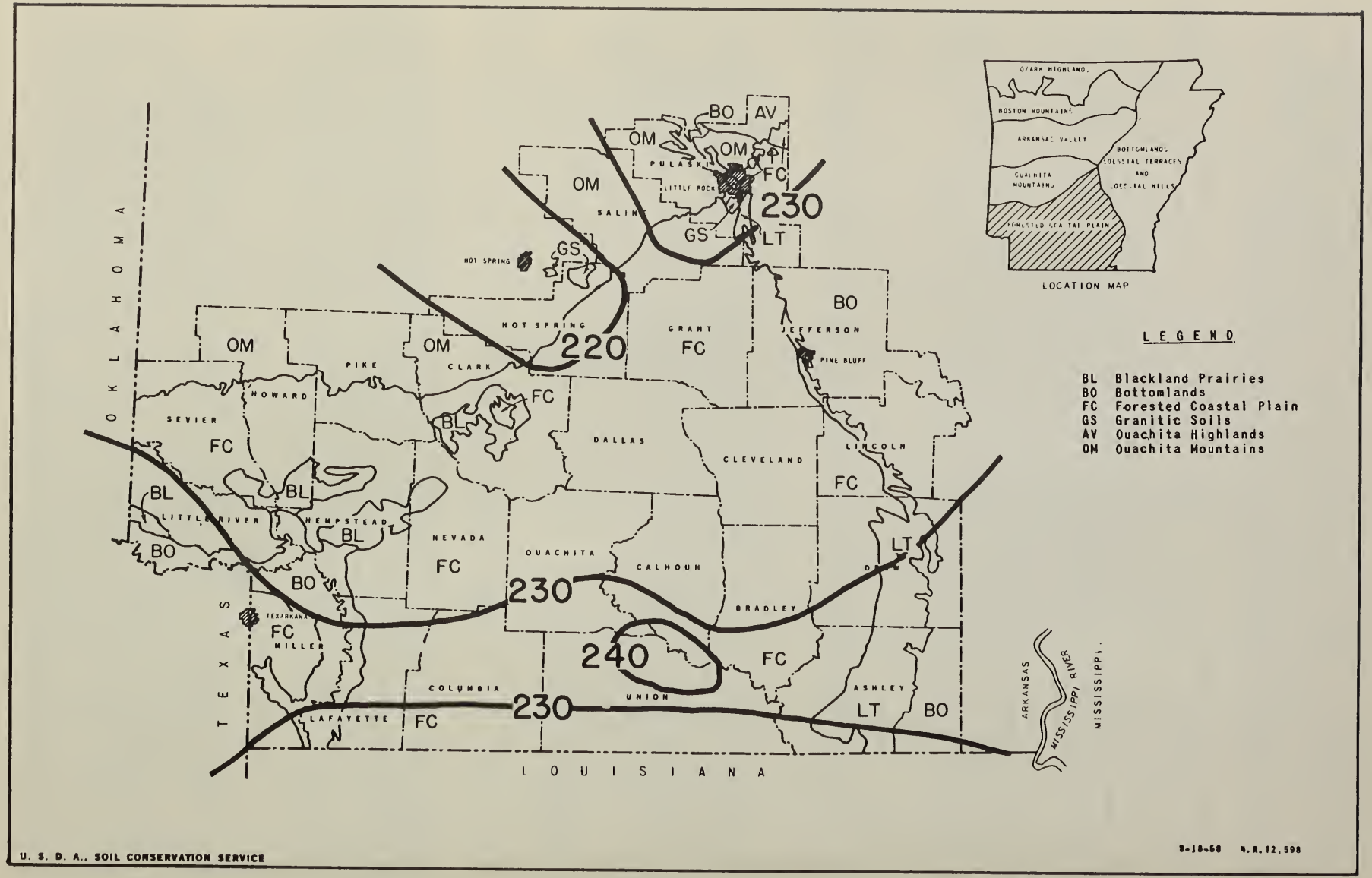

Figure 2. Average growing season (days) for shortleaf and loblolly pines, Forested Coastal Plain major soil area in Arkansas. (Based on data from USDA Yearbook, 1941, Climate and Man.)

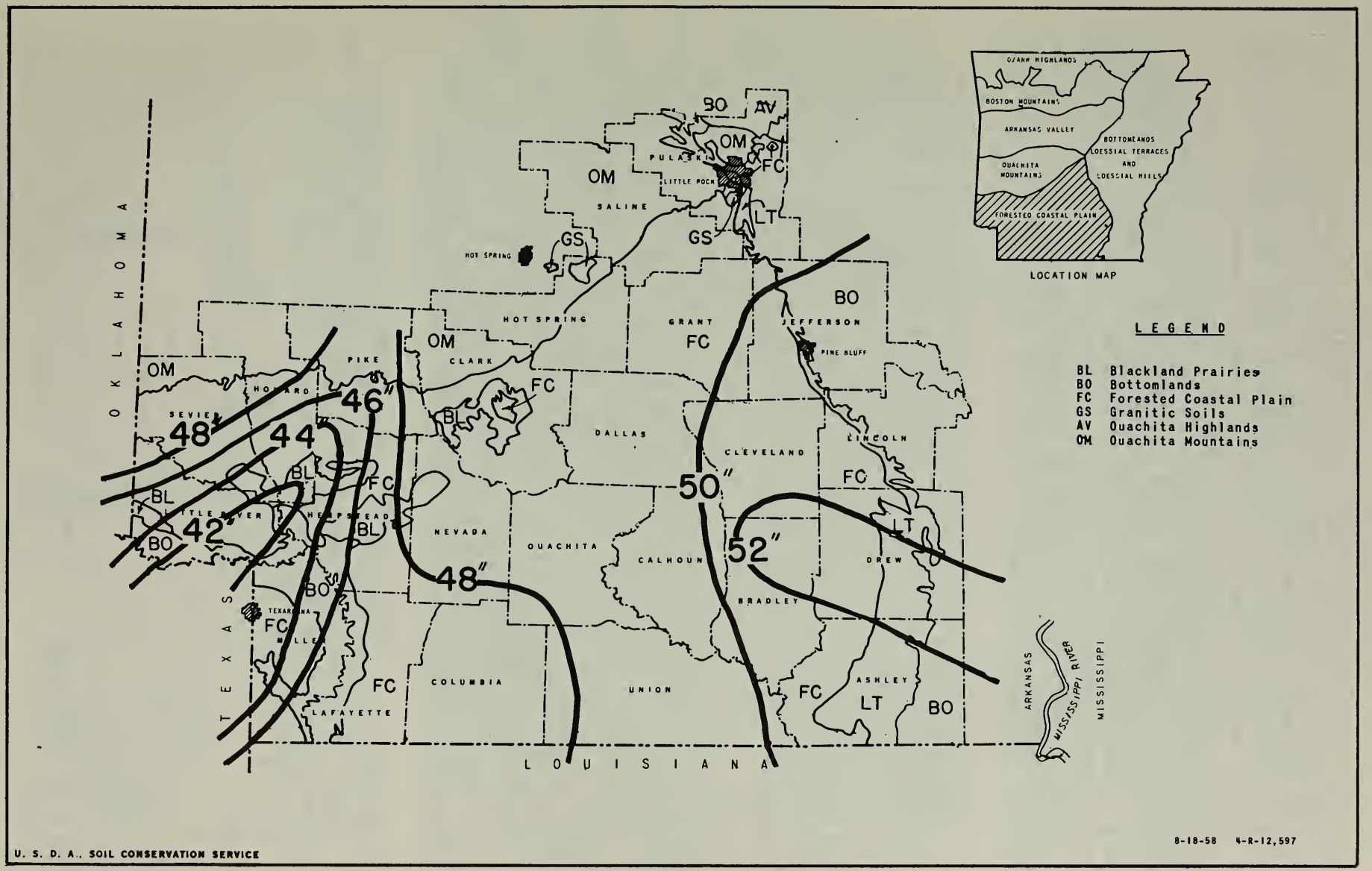

Figure 3. Average annual precipitation (inches), Forested Coastal Plain major soil area, Arkansas. (Based on data from USDA Yearbook, 1941, Climate and Man.)

Turner used published county soil surveys (Ashley County 1914, Columbia County 1916, Howard County 1919, Bradley County 1925) as a basis for identifying soils as they were examined in the field. Samples were also collected and analyzed in the laboratory. In order to group plot information so that like site quality would be shown, it apparently was necessary for the author to recognize soil phases not included in the county soil surveys. These phases have been called "superior," "medium," and "inferior." Some of the plots were located on transitional zones between recognized soil types and they have been so designated. The need for recognizing phases, not shown in soil mapping at the time, indicates that the mapping units were too broad to provide the necessary control for practical woodland management based on soil survey information. The work of Turner is considered excellent for the time it was done and is among the first to be published concerning soil-woodland relationships in the United States.

Zahner (12) (13) (14) (15), studied 206 shortleaf and loblolly pine stands in southern Arkansas and northern Louisiana. He found by detailed statistical analyses that site index is closely related to three factors: (1) surface soil thickness and texture, (2) subsoil texture, and (3) slope. On zonal soils (those with clearly distinguishable characteristics between the surface and subsoil), the surface soil thickness correlated directly with increasing site index to a maximum of 18 inches after which site quality decreased. On azonal soils (those where the surface soil grades gradually into the subsoil), site quality decreased with increasing amounts of silt in the surface soil. Subsoil texture of both zonal and azonal soils was correlated with site index, causing it to increase as fine materials in the subsoil increased from sandy loams to clay loams. Clay loam showed maximum site index. The site index for clay and silty clay subsoils was somewhat lower. Site index decreased as slope percent increased on the zonal soils of the uplands. Azonal soils are typical of the level areas and terraces, variation in site index due to slope was not indicated. Shortleaf pine was not a common associate of loblolly pine on the azonal soils. Its site index may be estimated from that of loblolly pine on these soils by using the following formula: Site index of shortleaf pine = 13 + 0.77 (loblolly pine site index). Zahner's studies, basic in character, present very helpful soils and woodland information. They provide a valuable local method for making spot evaluations of soils for woodland crops where soil maps are not available.

Chandler et al. (1) reports studies on 14, mostly one-acre, plots of shortleaf and loblolly pine stands in Polk, Tyler, Angelina and Nacogdoches Counties, Texas. These studies sample the Eastern Texas Pine Belt, a natural area essentially the same as the area included in this report. Average site indexes obtained are:

Soil Type	Shortleaf Pine	Loblolly Pine
Ochlockonee fine sandy loam	100	103
Lufkin fine sand	74	82
Segno fine sandy loam	72	81
Ruston fine sandy loam	74	80
Caddo fine sandy loam	73	78
Susquehanna fine sandy loam	68	73
Segno fine sand	62	58

Collection of Information

This report brings together in a concise and simplified form available knowledge about how soils influence the production of shortleaf and loblolly pines.

Field work reported here was completed by the Soil Conservation Service during the period 1955 to 1958. It consisted of a study of temporary plot locations. Complete information for each plot location was recorded on a specially designed form. The area of study and individual plot locations are shown in Figure 4.

Soil scientists who knew the major soils to be studied and woodland conservationists who knew the forest stands, selected locations after examining each area in detail.

The report is based in part on a study of 283 plots sampling 67 different kinds of soils. Types and phases of 33 different soil series have been included. A total of 817 trees were investigated, divided between 326 trees, 108 plots, of shortleaf pine, and 491 trees, 175 plots, of loblolly pine. Published information about woodland soils in this area has been studied carefully and used to verify and augment the findings in this study. Finally, the judgment and experience of local foresters, conservationists, soil scientists, woodland owners, and others have been used to develop the most practical and usable soil interpretations.

Major attention was given to the accurate identification of the soil on each plot according to the latest official correlation. Soils were required to be well within the described range of the type before a plot was acceptable. Soil examinations included spade and auger inspections to a depth sufficient to reveal the nature and identity of the profile. In the majority of cases this was to a depth of at least 40 inches. Records of the soil profile varied from complete descriptions as standardized in the Soil Survey Manual (10) on some plots, through abbreviated descriptions of some of the most important characteristics on other plots, to simply the identification of the soil type by name on others. Records made in each case were governed by the knowledge available about each soil and the representativeness of the profile being examined.

Careful attention was also given to the forest stand and the individual trees available for measurement in deciding upon the suitability of a plot. An attempt was made to select only stands and trees similar to those represented in the published site tables (USDA Misc. Pub. 50 (11)). Accordingly, only well-stocked stands of natural origin were measured. Although not specifically ascertained and recorded in every case, most of the plots were on soils that had never been cultivated. Stands that might have been influenced abnormally by such things as fire, insects, diseases, weather, management, or use were avoided. Only dominant or codominant, healthy appearing, uninjured trees were measured. If evidence were available to indicate that they may not have been growing in a dominant or codominant position throughout their entire life, or had had their growth arrested abnormally at any time, they were discarded from the sample. From two to six acceptable trees (average of 3) were measured on each plot. Measurements included:

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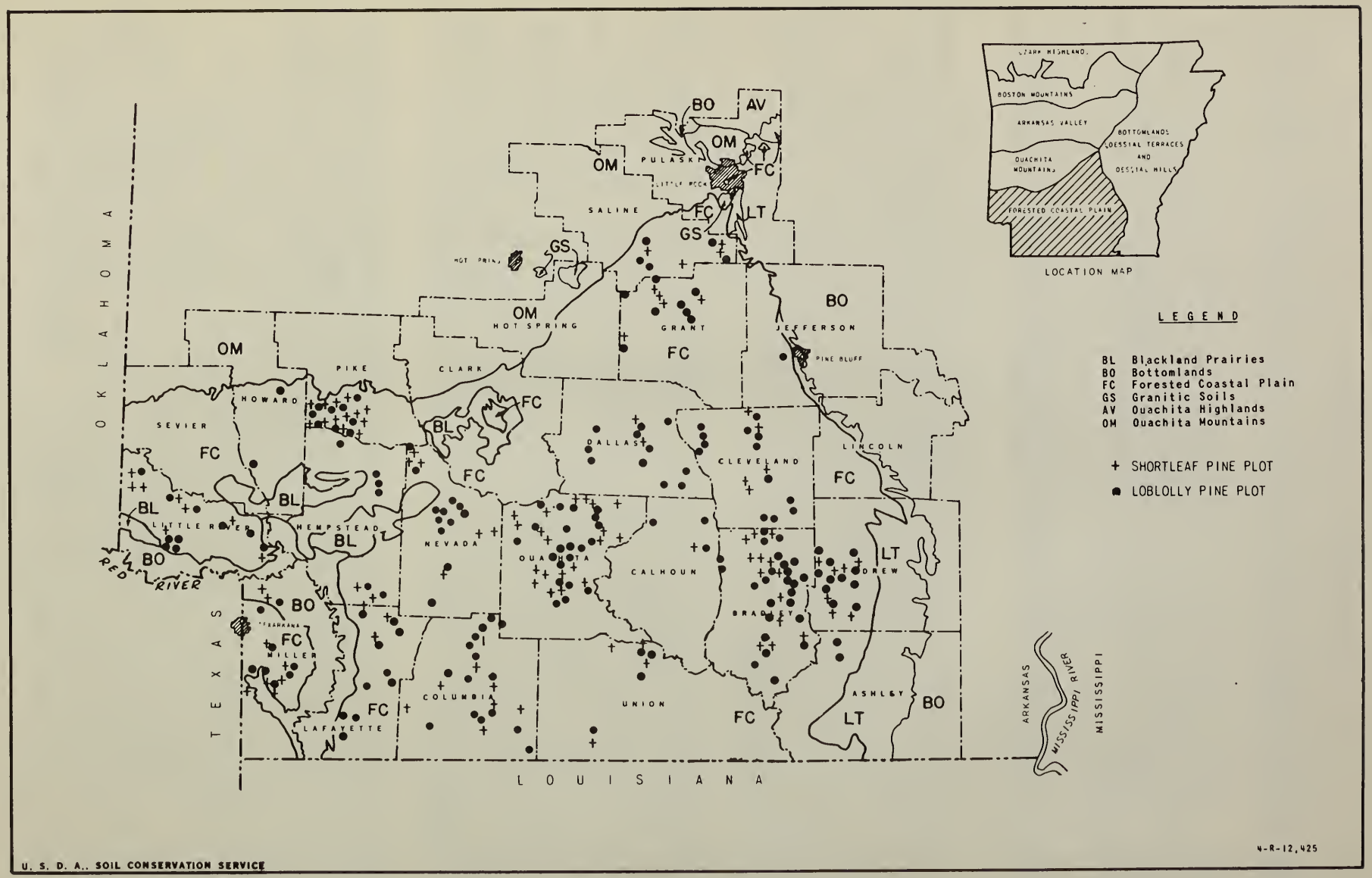

Figure 4. Soil-woodland site correlation plots, Forested Coastal Plain major soil area, Arkansas.

diameter at breast height taken with a diameter tape; ring count at breast height obtained by increment borings; and total height to the nearest foot measured by means of an Abney hand level and a tape. Three years were added to the ring count to correct it to total age. Site index was determined for each tree by use of published site index curves (USDA Misc. Pub. 50 (11)), adjusted by Cole and Schumacher 1953 (2), and posted to the plot records.1/ The average site index for all trees measured on each plot was then determined and posted. Plots sampled mainly the following forest cover types: shortleaf pine, loblolly pine-shortleaf pine, and loblolly pine, although a few would have been classified as cover types - shortleaf pine-oak, and loblolly pine-hardwood (Society of American Foresters, 1954 (4)).

In addition to soil profile information and tree measurements, other items were observed and recorded such as (1) plot number showing a county prefix; (2) major soil area; (3) soil conservation district within which the plot was located; (4) aspect was estimated to the nearest octant, assuming north to be from N22½°W to N22½°E and each adjoining octant including 45°; (5) functional slope position as either "lower," "middle" or "upper." Lower slope positions are those where above average accumulation of moisture develops. Upper slope positions lost moisture excessively due to exposure, or when transient moisture is lower than normal for the slope. Middle slope positions are those anywhere along a uniform slope where transient moisture is normal -- neither accumulated nor dissipated. Where position was not thought to be influencing, no rating of this item was given; (6) average slope gradient of each plot area was recorded by classes: A - 0 to 1 per cent, B - 1 to 3 per cent, C - 3 to 5 per cent, D - 5 to 8 per cent, E - 8 to 12 per cent, F - 12 to 20 per cent, and G - 20 per cent and above; (7) existing soil erosion was rated into classes after plot inspection. Class 1 showed little or no erosion - where not more than 25 per cent of the A horizon had been removed by erosion. Class 2 signified slight to moderate erosion. Class 3 indicated moderate to severe erosion - where from 50 to 75 per cent of the A horizon had been lost. Class 4 showed severe erosion - where from 75 to 100 per cent of the A horizon was gone. None of the plots examined fell in the 4 erosion class; (8) wetness classes were used to designate differences in surface and internal drainage and soils of each plot were rated for this element as moderately wet, slightly wet or not wet; (9) occasionally some general remarks were included on the plot record noting miscellaneous items about the forest stand, individual trees, or specific site features thought to be important for complete analysis of the data.

Total annual precipitation and an 8-month growing season precipitation (March through October) based on climatological information (USDA 1941 (8)) brought up to date by U. S. Weather Bureau records were posted to each plot record in the office. The average length of the frost-free period was also determined from published records and posted.

1/ Site index is the average total height of dominant and codominant trees in a normally growing, well-stocked stand at 50 years of age. It is accepted as the most reliable site indicator of soil productivity for forest trees that normally grow in even-aged stands.

M. 28. 59

Analyses and Presentation of Soil Productivity Information

A complete and systematic analysis of the data obtained has not been attempted in this report. This is planned when like information from the same natural area in adjacent states can be included. Simple correlations between site index of the two species as measured on the plots and such recorded items as wetness class, erosion class, slope class, aspect, total and growing season precipitation, length of the frost-free period and slope position were made by plotting on cross-section paper. No obviously significant relationships among the variables were established by these simple techniques except for the effect of slope position on site index for Saffell gravelly fine sandy loam. It was decided, therefore, to ignore such influences as may have been caused by these factors (except for slope position on the Saffell gravelly fine sandy loam) and use average site index values obtained from samples within soil types as a soil productivity basis for practical application of soil information.

Data were not available for all soils in the study area on which shortleaf and loblolly pine will be grown. It was necessary, therefore, to estimate the site index for certain soils based on measurements made on soils of similar characteristics. All site index data are presented in Table 1; estimated site indexes are indicated.

A review of this table shows that the majority of the soils investigated are good producers of shortleaf and loblolly pine. Many of the soils have a site index of approximately 70 to 80 feet for shortleaf and 80 to 90 feet for loblolly pine. The bottomland soils are the most productive for loblolly pine, having a site index ranging generally from 90 to 98 feet. Shortleaf pine does not ordinarily occur on these soils. Adequate stands were not found for measurement of site index.

The site index on Saffell gravelly fine sandy loam, lower slope phase (lower one-third of slope) is much higher for both species of pine studied than on the Saffell gravelly fine sandy loam, upper slope phase (upper one-third of slope). The site index for shortleaf is 82 feet for the lower slope phase and 68 feet for the upper slope phase, 14 foot difference. For loblolly there is a 13 foot difference, the lower slope phase having an 84 foot site index and upper slope phase 71 foot site index. It is believed that the greater productivity of the Saffell gravelly fine sandy loam, lower slope phase, may be due primarily to the larger quantities of moisture coming by lateral movement from the upper slope area.

The average height of all trees studied was 72 feet for shortleaf and 78 feet for loblolly. The average age of trees was 48 years for shortleaf and 47 years for loblolly. The average site index of all shortleaf plots was 74 feet and of all loblolly plots 80 feet, a difference of six feet in site index in favor of loblolly pine. This difference reflects the high site index of the alluvial soils for loblolly pine and not data on the alluvial soils for shortleaf pine. Excluding the data for loblolly pine on the alluvial soil areas, comparing shortleaf and loblolly data from the upland and terrace soils, the average site index for shortleaf is 74 feet and loblolly 78 feet, a difference in site index of four feet in favor of loblolly pine.

M-28-59

TABLE 1

AVERAGE SITE INDEX FOR SHORTLEAF AND LOBLOLLY PINE IN FORESTED COASTAL PLAIN AREA OF ARKANSAS BY SOIL TYPES

Soil Type	Average Site Index	
	Shortleaf	Loblolly
*Almont silt loam	69	77
Amite fine sandy loam	75	74
Amite sandy loam	81	83**
Bibb silt loam	***	89
Bibb very fine sandy loam	***	92
Boswell fine sandy loam	72	79
Boswell gravelly fine sandy loam	68	75
Bowie fine sandy loam	81	84
Bowie very fine sandy loam	81	85
Bowie sandy loam	79**	91
Bowie loamy fine sand	75	80
Caddo very fine sandy loam	74	83
Cahaba fine sandy loam	79**	81
Dougherty fine sandy loam	75	79
Dougherty very fine sandy loam	79**	80
Eustis loamy fine sand	77	78**
Eustis loamy sand	73	77
Iuka fine sandy loam	***	88
Iuka very fine sandy loam	***	83
Iuka silt loam	***	90
Izagora very fine sandy loam	71**	70
Izagora silt loam	71**	78
Kalmia fine sandy loam	79**	79
Kirvin fine sandy loam	77	68
Lakeland loamy fine sand	71**	81
Lakeland loamy sand	69	83
Leaf fine sandy loam	69**	83
Leaf silt loam	69**	79
Mantachie fine sandy loam	***	93
Mantachie very fine sandy loam	***	94
Mantachie sandy loam	***	95
Mantachie silt loam	***	98

M-28-59

TABLE 1 (Cont'd)

Soil Type	Average Site Index Shortleaf	Loblolly
Myatt fine sandy loam	74*	78
Myatt very fine sandy loam	75	81
Myatt silt loam	77	72
Norfolk fine sandy loam	79	82
Norfolk sandy loam	79	81
Norfolk loamy fine sand	76*	79
Ochlockonee fine sandy loam	***	96
Ochlockonee silt loam	***	96
Pheba fine sandy loam	74	80
Pheba very fine sandy loam	82	80
Prentiss fine sandy loam	77**	81
Prentiss very fine sandy loam	77	84
*Red Bayou fine sandy loam	89	91
*Red Bayou very fine sandy loam	89**	93
Ruston fine sandy loam	76	83
Ruston loamy sand	78	85
Saffell fine sandy loam	73	80
Saffell gravelly fine sandy loam, upper slope phase	68	71
Saffell gravelly fine sandy loam, lower slope phase	82	84
Savannah fine sandy loam	76	78
Savannah very fine sandy loam	70	84
Sawyer fine sandy loam	76	83
Sawyer very fine sandy loam	77	84
Shubuta fine sandy loam	71	82
Shubuta gravelly fine sandy loam	74**	83
Stidham fine sandy loam	74**	78
Stough fine sandy loam	80	83
Stough very fine sandy loam	73	80
Susquehanna fine sandy loam	71**	74
Susquehanna very fine sandy loam	66	73
Tilden fine sandy loam	81	83**
Wilcox silty clay	71	82

M-28-59

TABLE 1 (Cont'd)

Soil Type	Average Site Index Shortleaf	Loblolly
Wrightsville silt loam	70	77
Wrightsville silty clay loam	65**	73
Wrightsville silty clay	56	73**

* Tentative series.
** Data supplied on basis of measurements made on other soils with like physical characteristics.
*** Shortleaf pine does not ordinarily occur on these soils and stands were not found for adequate measurements of site index. Although shortleaf will grow on them, it is less well adapted than loblolly pine and the latter would be recommended.

Appendix Table 1 (shortleaf pine) and Appendix Table 2 (loblolly pine) show complete information obtained for individual plots arranged alphabetically by soil type name.

WOODLAND SUITABILITY GROUPINGS OF SOILS
INTERPRETATIONS FOR WOODLAND CONSERVATION

Soils greatly influence the suitability of land for woodland use. Up to this point we have been concerned mainly with the influence soils have upon rate of tree growth. We call this potential "soil productivity" and it is indicated by site index ratings for different species on different soils. They are called "potential" productivity ratings because they show comparative information about expected yields from wood crops that are grown in a specified way. Site index determinations were made on well-stocked, even-aged stands under normal growing conditions not adversely affected by such factors as fire, insects, disease, livestock or wildlife use, etc. Site index information for these kinds of stands is easily converted into volume estimates of growth and yield. Expected yields by site index classes at different ages, expressed in cubic feet, cords, and board feet per acre, and other statistics such as height of the dominant stand, average diameter, and number of trees per acre may be obtained from Appendix Table 4. These data were taken from USDA Misc. Pub. 50. Such soil productivity information (qualitative as shown by site index and quantitative as interpreted from normal yield tables) provides a basis for judging the economic feasibility of using specific woodland conservation measures.

Soils also influence such things as regeneration potential or the ease with which seedlings can develop and become established when the original stand is harvested or removed; plant competition and brush encroachment hazards that may limit or inhibit the growth of desired tree species following fire or harvest; trafficability or equipment limitations during wood crop tending and tree harvesting; hazards of financial loss to a wood crop due to windthrow; problems of controlling undesirable soil erosion during certain phases of a wood crop rotation or in connection with certain operations such

M-28-59

as construction and maintenance of roads and skidtrails; and species adaptability, thereby giving an owner a basis for assigning species priority to his wood-producing areas.

These are all interpretations of soil survey data, and are of vital concern to the woodland owner. He needs to plan his soils and tree crop management with due recognition of them. Since they are all related in one way or another to the kind of soil upon which a wood crop may be growing, woodland owners can guide their operations more effectively if a knowledge of these soil interpretations is available to them. A modern soil survey including a soil map and complete soil interpretative information is a guide in selecting the best combination of woodland conservation practices and helps woodland owners make the best choices of soils on which to produce wood crops.

A system of rating woodland soils in the Forested Coastal Plain Area of Arkansas for the soil-related items important to woodland conservation has been developed. The criteria used for rating each group of soil mapping units (soil types and phases) of the 67 soils shown in Table 1, for each woodland conservation item, together with the rating chart showing individual ratings, are presented in Appendix B. The soils that have been rated alike with respect to the various items and that are similar in major physical soil characteristics have been assembled into nine WOODLAND SUITABILITY GROUPS as shown in Table 2. Interpretations useful in woodland conservation and applicable to soils included in each group are presented below.

Woodland Suitability Group 1

Mapping units of three soil types are included in this group. These are the soils with a fine textured surface. They are very slowly permeable, somewhat poor to poorly drained, Table 3.

The average site index for shortleaf pine is 63 and for loblolly pine 79. Because of the relatively wide range in site index of some of these soils, it is recognized that some additional study will be desirable. Locating sites with dominant and co-dominant trees is very difficult. Based on normal yield tables, this group of soils will yield per acre by the Doyle log rule about 6,000 board feet of shortleaf pine or 11,000 board feet of loblolly pine at 50 years. This assumes a well-stocked, normally growing stand without intermediate cuttings. Higher total yields in terms of board feet can be attained by making periodic thinnings throughout the 50-year rotation.

The degree of plant competition is moderate. Plant competition develops on these soils but will not ordinarily prevent adequate stand establishment of the designated species. Establishment may be delayed and initial growth rate slowed, thereby delaying the development of a normal, fully-stocked stand. Site preparation is not essential on these soils for the establishment of an adequate stand of the designated species but some simple management techniques can be used to minimize the problem.

The equipment limitations on this group of soils are considered to be moderate to severe. A moderate problem exists on the Wilcox silty clay loam. This problem exists over a period of less than three months per year when the texture and slope of the soil require some attention in use of equipment to

M-28-59

TABLE 2. WOODLAND SUITABILITY GROUPINGS OF SOILS FOR THE FORESTED COASTAL PLAIN AREA OF ARKANSAS 1/

GROUP NO.	SOIL TYPES	SYMBOL DESIGNATING GROUPING OF MAPPING UNITS	AVERAGE SITE INDEX		2/ DEGREE PLANT COMPETITION	3/ EQUIPMENT LIMITATIONS	4/ SEEDLING MORTALITY PLANTINGS	5/ WINDTHROW HAZARDS	6/ EROSION HAZARDS
			SHORTLEAF PINE	LOBLOLLY PINE					
1	Wilcox silty clay	1							
	Wrightsville silty clay	1a	63	79	Moderate	Moderate to severe	Slight	Slight to moderate	Moderate to slight
	Wrightsville silty clay loam	1a							
	Amite fine sandy loam	7							
	Boswell gravelly fine sandy loam	5d							
	Boswell fine sandy loam	5							
	Izagora silt loam	5							
2	Izagora very fine sandy loam	5	70	74	Moderate	Slight to moderate	Slight	Slight	Moderate to very severe
	Kirvin fine sandy loam	6							
	Susquehanna fine sandy loam	5							
	Susquehanna very fine sandy loam	5							
	Saffell gravelly fine sandy loam, upper slope phase	7d							
	Bowie loamy fine sand	12							
	Norfolk loamy fine sand	12							
	Ruston loamy sand	12							
3	Eustis loamy fine sand	13	73	79	Moderate	Slight	Moderate	Slight	Moderate to very severe
	Eustis loamy sand	13							
	Lakeland loamy fine sand	13							
	Lakeland loamy sand	13							
	*Almont silt loam	5a1							
	Leaf fine sandy loam	5a1							
	Leaf silt loam	5a1							
	Caddo very fine sandy loam	5a							
	Myatt fine sandy loam	5a							
4	Myatt silt loam	5a	75	80	Moderate	Severe to moderate	Slight	Slight to moderate	Slight
	Myatt very fine sandy loam	5a							
	Wrightsville silt loam	5a							
	Pheba fine sandy loam	6a1							
	Pheba very fine sandy loam	6a1							
	Stough fine sandy loam	6a1							
	Stough very fine sandy loam	6a1							
	Prentiss fine sandy loam	6							
	Prentiss very fine sandy loam	6							
	Savannah fine sandy loam	6							
	Savannah very fine sandy loam	6							
5	Tilden fine sandy loam	6	75	82	Moderate	Slight to moderate	Slight	Slight	Moderate to very severe
	Stidham fine sandy loam	6							
	Shubuta fine sandy loam	6							
	Shubuta gravelly fine sandy loam	6d							
	Sawyer fine sandy loam	6							
	Sawyer very fine sandy loam	6							
	Saffell fine sandy loam	7							

M-28-59

TABLE 2. WOODLAND SUITABILITY GROUPINGS OF SOILS FOR THE FORESTED COASTAL PLAIN AREA OF ARKANSAS 1/, CONTINUED

GROUP NO.	SOIL TYPES	SYMBOL DESIGNATING GROUPING OF MAPPING UNITS	AVERAGE SITE INDEX		2/ DEGREE PLANT COMPETITION	3/ EQUIPMENT LIMITATIONS	4/ SEEDLING MORTALITY PLANTINGS	5/ WINDTHROW HAZARDS	6/ EROSION HAZARDS
			SHORTLEAF PINE	LOBLOLLY PINE					
6	Amite sandy loam	7	79	83	Moderate	Slight	Slight	Slight	Moderate to very severe
	Bowie fine sandy loam	7							
	Bowie very fine sandy loam	7							
	Bowie sandy loam	7							
	Cahaba fine sandy loam	7							
	Kalmia fine sandy loam	7							
	Norfolk fine sandy loam	7							
	Norfolk sandy loam	7							
	Ruston fine sandy loam	7							
	Dougherty fine sandy loam	7							
	Dougherty very fine sandy loam	7							
	Saffell gravelly fine sandy loam, lower slope phase	7d							
7	*Red Bayou fine sandy loam	7	89	91	Moderate	Slight	Slight	Slight	Moderate to severe
	*Red Bayou very fine sandy loam	7							
8	Iuka fine sandy loam	9	7/	91	Severe	Slight	Slight	Slight	Slight
	Iuka very fine sandy loam	9							
	Iuka silt loam	9							
	Ochlockonee fine sandy loam	9							
	Ochlockonee silt loam	9							
9	Bibb very fine sandy loam	8a	7/	92	Severe	Severe	Slight	Slight	Slight
	Bibb silt loam	8a							
	Mantachie fine sandy loam	8a1							
	Mantachie very fine sandy loam	8a1							
	Mantachie silt loam	8a1							
	Mantachie sandy loam	8a1							

* Tentative series.

1/ Soil surveys have been made in Arkansas for many years. The listing of soil types, and symbols designating grouping of mapping units, is such that the available soil maps can be used in identifying information and interpretations for Woodland Suitability Groups. The old soil type maps made from 1937 to 1943 and the new standard (soil type) surveys started in 1954 show soil types as listed in column 2. The conservation surveys made since 1943 carry the symbols of mapping units as shown in column 3. By the use of the appropriate column and the mapping symbols in the soil surveys, the interpretations can be readily identified. This table has been designed to be of most use in supplying interpretations for the mapping units in different soil mapping legends.

2/ Refers to rate that undesirable species invade different soils (brush encroachment) following removal of tree overstory or when openings are made in the canopy.

3/ Refers to those soil characteristics and topographic features that restrict or prohibit the use of equipment commonly used in crop tending or tree harvesting.

4/ Refers to expected degree of mortality of planted tree seedlings as influenced by kinds of soil.

5/ Refers to those soil characteristics that control tree root development affecting wind firmness.

6/ Refers to potential erosion hazard of the soil when the area is not properly managed.

7/ Shortleaf pine does not ordinarily occur on these soils and stands were not found for adequate measurements of site index.

M-20-59

prevent damage to tree roots, soil structure and stability. On the other two soils the problem is severe because of the additional wetness factor. Special attention must be given to equipment use during a period greater than three months per year to prevent serious damage to tree roots, soil structure and stability.

No special problems of seedling mortality of plantings are expected on this group of soils. Normally, satisfactory restocking by initial planting can be expected.

The windthrow hazard of this group of soils is slight to moderate. No special problem is recognized for the Wilcox silty clay but some attention to this hazard needs to be given on the other two soils in controlling stand density when thinning or doing release cuttings, or in the final or regeneration cut to prevent loss of trees.

The erosion hazard of this group is moderate to slight. The moderate problem occurs on the sloping phases of Wilcox silty clay.

Woodland Suitability Group 2

Eight soil types and one phase of a soil type are included in this group. All but two of the soils are deep, medium textured, very slowly permeable. The two soils, Amite fine sandy loam and Saffel gravelly fine sandy loam, upper slope phase, are deep, medium textured, moderately permeable soils, Table 3.

The average site index is 70 for shortleaf and 74 for loblolly pine. Based on normal yield tables of well-stocked, normally growing stand, this group of soils will yield per acre approximately 8,650 board feet (Doyle rule) of both shortleaf pine and loblolly pine at age 50 years. Total yields can be increased by periodic thinnings.

The degree of plant competition is moderate. The development of some plant competition can be expected but it will not prevent the adequate establishment of the desired species. Establishment may be delayed and initial growth slowed, but special site preparation is not essential. Some simple measures such as light seedbed preparation may be of value in minimizing the problem.

The equipment limitations of soils in this group vary from slight to moderate. The Amite fine sandy and Saffell gravelly fine sandy loams have no special equipment limitations. The other soils have a moderate problem due to the presence of fine textured layers in the subsoil and some damage to tree roots may be expected from equipment on these soils during a period of less than three months each year.

There are no special problems of seedling mortality of plantings on this group of soils. Satisfactory restocking by initial plantings can be expected.

No special problem of windthrow hazard is recognized. Individual trees can be expected to remain standing where released on all sides.

M-28-59

TABLE 3. GENERAL CHARACTERISTICS OF SOILS IN WOODLAND SUITABILITY GROUPS - FORESTED COASTAL PLAIN - ARKANSAS

GROUP NO.	SOIL TYPES	MAPPING UNIT GROUP SYMBOL	POSITION	SOIL CHARACTERISTICS: PROFILE	SURFACE SOIL: COLOR	SURFACE SOIL: TEXTURE	SUBSOIL: COLOR	SUBSOIL: TEXTURE	DRAINAGE	AVERAGE SITE INDEX: SHORTLEAF	AVERAGE SITE INDEX: LOBLOLLY
1	Wilcox sic	1	Upland	Surface 0–12" sicl–sic	Light brownish gray	Silty clay	Mottled red, light gray, & yellow	Clay	Somewhat poor to poor	63	79
	Wrightsville sic	1a	Terrace		Light gray to gray	Silty clay	Light gray & gray mottled	Silty clay loam to clay			
	Wrightsville sicl	1a	Terrace	Subsoil 12–40"+ c	Light gray to gray	Silty clay loam	Light gray & gray mottled	Silty clay loam to clay			
2	Amite fsl	7	Terrace	Surface 0–12" gfsl–sil	Brown to yellowish red	Fine sandy loam	Red	Sandy clay loam to sandy clay	Moderately well to well	70	74
	Boswell gfsl	5d	Upland		Light brownish gray to pale brown	Gravelly fine sandy loam	Red to mottled red, gray, & yellow	Clay			
	Boswell fsl	5	Upland		Light brownish gray to pale brown	Fine sandy loam	Red to mottled red, gray, & yellow	Clay			
	Izagora sil	5	Terrace		Grayish brown	Silt loam	Yellowish brown, mottled	Sandy clay loam to clay			
	Izagora vfsl	5	Terrace	Subsoil 12–30" scl–c	Grayish brown	Very fine sandy loam	Yellowish brown, mottled	Sandy clay loam to clay			
	Kirvin fsl	6	Upland		Pale brown to light brownish gray	Fine sandy loam	Red to reddish brown, mottled	Sandy clay to sandy clay loam			
	Susquehanna fsl	5	Upland		Light gray	Fine sandy loam	Mottled red, gray, & yellow	Clay			
	Susquehanna vfsl	5	Upland		Light gray	Very fine sandy loam	Mottled red, gray, & yellow	Clay			
	Saffell gfsl, upper slope phase	7d	Upland	30–40"+ sc–c	Brown	Gravelly fine sandy loam	Reddish brown	Gravelly sandy clay loam			
3	Bowie lfs	12	Upland	Surface 0–15" lfs–ls	Grayish brown	Loamy fine sand	Yellowish brown to brownish yellow	Sandy clay loam	Somewhat excessive to excessive	73	79
	Norfolk lfs	12	Upland		Gray to pale brown	Loamy fine sand	Yellowish brown to pale brown	Sandy loam to sandy clay loam			
	Ruston ls	12	Upland		Grayish brown to light yellowish brown	Loamy sand	Reddish brown to yellowish red	Sandy clay loam			
	Eustis lfs	13	Upland	Subsoil 15–40"+ sl–scl–ls	Grayish brown	Loamy fine sand	Reddish brown to reddish yellow	Loamy sand			
	Eustis ls	13	Upland		Grayish brown	Loamy sand	Reddish brown to reddish yellow	Loamy sand			
	Lakeland lfs	13	Upland		Grayish brown	Loamy fine sand	Yellowish brown to brownish yellow	Loamy sand			
	Lakeland ls	13	Upland		Grayish brown	Loamy sand	Yellowish brown to brownish yellow	Loamy sand			

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, Little Rock, Arkansas

Revised 8-28-59 4-R-12584 Sheet 1 of 3

M-28-59

TABLE 3. GENERAL CHARACTERISTICS OF SOILS IN WOODLAND SUITABILITY GROUPS - FORESTED COASTAL PLAIN - ARKANSAS, CONTINUED

GROUP NO.	SOIL TYPES	MAPPING UNIT GROUP SYMBOL	POSITION	SOIL CHARACTERISTICS					AVERAGE SITE INDEX	
				PROFILE	SURFACE SOIL		SUBSOIL		DRAINAGE	SHORT-LEAF	LOB-LOLLY
					COLOR	TEXTURE	COLOR	TEXTURE			
4	Almont sil	5a1	Terrace	Surface 0–12" sil–fsl	Light yellowish brown with mottles	Silt loam	Gray, mottled	Clay	Somewhat poor to poor	75	80
	Leaf fsl	5a1	Terrace		Grayish brown to gray	Fine sandy loam	Yellowish brown to gray, mottled	Clay			
	Leaf sil	5a1	Terrace		Grayish brown to gray	Silt loam	Yellowish brown to gray, mottled	Clay			
	Caddo vfsl	5a	Upland		Oark grayish brown to gray	Very fine sandy loam	Gray, mottled	Silty clay to clay			
	Myatt fsl	5a	Terrace		Light gray to gray	Fine sandy loam	Gray, mottled	Sandy clay loam			
	Myatt sil	5a	Terrace		Light gray to gray	Silt loam	Gray, mottled	Silty clay loam			
	Myatt vfsl	5a	Terrace	Subsoil 12–40"+ sicl–c	Light gray to gray	Very fine sandy loam	Gray, mottled	Silty clay loam			
	Wrightsville sil	5a	Terrace		Light gray to gray	Silt loam	Gray, mottled	Silty clay loam to clay			
	Pheba fsl	6a1	Upland		Light grayish brown	Fine sandy loam	Yellow, mottled	Sandy clay loam to sandy clay			
	Pheba vfsl	6a1	Upland		Light grayish brown	Very fine sandy loam	Yellow, mottled	Sandy clay loam to sandy clay			
	Stough fsl	6a1	Terrace		Grayish brown to pale brown	Fine sandy loam	Light gray to yellow, mottled	Sandy clay loam			
	Stough vfsl	6a1	Terrace		Grayish brown to pale brown	Very fine sandy loam	Light gray to yellow, mottled	Sandy clay loam			
5	Prentiss fsl	6	Terrace	Surface 0–12" vfsl–gfsl	Grayish brown to yellowish brown	Fine sandy loam	Yellow to mottled gray & brown	Sandy clay loam	Moderately well	75	82
	Prentiss vfsl	6	Terrace		Grayish brown to yellowish brown	Very fine sandy loam	Yellow to mottled gray & brown	Sandy clay loam			
	Savannah fsl	6	Upland		Grayish brown to yellowish brown	Fine sandy loam	Yellow to mottled gray & brown	Sandy clay loam			
	Savannah vfsl	6	Upland		Grayish brown to yellowish brown	Very fine sandy loam	Yellow to mottled gray & brown	Sandy clay loam			
	Tilden fsl	6	Terrace		Grayish brown to brown	Fine sandy loam	Brown to reddish brown, mottled	Sandy loam to sandy clay loam			
	Stidham fsl	6	Terrace	Subsoil 12–40"+ scl–sc	Pale brown	Fine sandy loam	Yellowish brown to mottled	Sandy clay loam			
	Shubuta fsl	6	Upland		Yellowish brown to grayish brown	Fine sandy loam	yellowish red	Sandy clay loam to clay			
	Shubuta gfsl	6d	Upland		Yellowish brown to grayish brown	Gravelly fine sandy loam	Strong brown to red	Sandy clay loam to clay			
	Sawyer fsl	6	Upland		Grayish brown to yellowish brown	Fine sandy loam	Strong brown to red	Sandy clay loam to clay			
	Sawyer vfsl	6	Upland		Grayish brown to yellowish brown	Very fine sandy loam	Brownish yellow, mottled	Sandy clay loam to clay			
	Saffell fsl	7	Upland		Brown	Fine sandy loam	Brownish yellow, mottled Reddish brown	Gravelly sandy clay loam			
6	Amite sl	7	Terrace	Surface 0–12" vfsl–sl	Brown to yellowish red	Sandy loam	Red	Sandy clay loam	Well	79	83
	Bowie fsl	7	Upland		Grayish brown to pale brown	Fine sandy loam	Yellowish brown to brownish yellow	Fine sandy loam to sandy clay loam			
	Bowie vfsl	7	Upland		Grayish brown to pale brown	Very fine sandy loam	Yellowish brown to brownish yellow	Fine sandy loam to sandy clay loam			
	Bowie sl	7	Upland		Grayish brown to pale brown	Sandy loam	Yellowish brown to brownish yellow	Sandy loam to sandy clay loam			
	Cahaba fsl	7	Terrace		Oark grayish brown to brown	Fine sandy loam	Yellowish red	Fine sandy loam to sandy clay loam			
	Kalmia fsl	7	Terrace	Subsoil 12–40"+ sl–scl	Oark brown to yellowish brown	Fine sandy loam	Yellowish brown	Fine sandy loam to sandy clay loam			
	Norfolk fsl	7	Upland		Grayish brown to light yellowish brown	Fine sandy loam	Yellowish brown to pale brown	Fine sandy loam to sandy clay loam			
	Norfolk sl	7	Upland		Grayish brown to light yellowish brown	Sandy loam	Yellowish brown to pale brown	Sandy loam to sandy clay loam			
	Ruston fsl	7	Upland		Grayish brown to yellowish brown	Fine sandy loam	Reddish brown to yellowish red	Sandy clay loam to sandy loam			
	Oougherty fsl	7	Terrace		Grayish brown to light brown	Fine sandy loam	Red to reddish yellow	Sandy loam to sandy clay loam			
	Oougherty vfsl	7	Terrace		Grayish brown to light brown	Very fine sandy loam	Red to reddish yellow	Sandy loam to sandy clay loam			
	Saffell gfsl, lower slope phase	7d	Upland		Brown	Gravelly fine sandy loam	Reddish brown	Gravelly sandy clay loam			

* Tentative series.

TABLE 3. GENERAL CHARACTERISTICS OF SOILS IN WOODLAND SUITABILITY GROUPS - FORESTED COASTAL PLAIN - ARKANSAS, CONTINUED

GROUP NO.	SOIL TYPES	MAPPING UNIT GROUP SYMBOL	POSITION	SOIL CHARACTERISTICS: PROFILE	SURFACE SOIL: COLOR	SURFACE SOIL: TEXTURE	SUBSOIL: COLOR	SUBSOIL: TEXTURE	DRAINAGE	AVERAGE SITE INDEX: SHORTLEAF	AVERAGE SITE INDEX: LOBLOLLY
7 *	Red Bayou fsl	7	Terrace	Surface 0-10" vfsl fsl; Subsoil 10-40"+ scl	Grayish brown to brown	Fine sandy loam	Yellowish brown, mottled red & gray	Sandy clay loam	Well	89	91
*	Red Bayou vfsl	7	Terrace		Grayish brown to brown	Very fine sandy loam	Yellowish brown, mottled red & gray	Sandy clay loam			
	Iuka fsl	9	Bottom	Surface 0-10" vfsl-sil; Subsoil 10-40"+ fsl-sil	Grayish brown to dark brown	Fine sandy loam	Yellowish brown to light gray	Fine sandy loam	Moderately well to well	1/	91
	Iuka vfsl	9	Bottom		Grayish brown to dark brown	Very fine sandy loam	Yellowish brown to light gray	Fine sandy loam			
8	Iuka sil	9	Bottom		Grayish brown to dark brown	Silt loam	Yellowish brown to light gray	Silt loam			
	Ochlockonee fsl	9	Bottom		Grayish brown to dark brown	Fine sandy loam	Brown to yellowish brown	Fine sandy loam			
	Ochlockonee sil	9	Bottom		Grayish brown to dark brown	Silt loam	Brown to yellowish brown	Silt loam			
	Bibb vfsl	$8a$	Bottom	Surface 0-8" sil fsl; Subsoil 8-40"+ sil-sl sicl-scl	Dark gray to gray, mottled	Very fine sandy loam	Gray to light gray, mottled	Sandy clay loam	Poor to somewhat poor	1/	92
	Bibb sil	$8a$	Bottom		Dark gray to gray, mottled	Silt loam	Gray to light gray, mottled	Silty clay loam			
9	Mantachie fsl	$8a_1$	Bottom		Dark grayish brown to brown, mottled	Fine sandy loam	Light gray, mottled	Sandy clay loam			
	Mantachie vfsl	$8a_1$	Bottom		Dark grayish brown to brown, mottled	Very fine sandy loam	Light gray, mottled	Sandy clay loam			
	Mantachie sil	$8a_1$	Bottom		Dark grayish brown to brown, mottled	Silt loam	Light gray, mottled	Silty clay loam			
	Mantachie sl	$8a_1$	Bottom		Dark grayish brown to brown, mottled	Sandy loam	Light gray, mottled	Sandy clay loam			

* Tentative series.

1/Shortleaf pine does not ordinarily occur on these soils and adequate stands were not found for measurement of site index.

Revised 8-28-59 4-R-12584 Sheet 3 of 3

The erosion hazard of this group of soils varies from moderate to very severe. The Amite, Saffell, and Izagora series vary from moderate to severe, whereas the other soils have a severe to very severe problem. Attention should be given to the location and maintenance of roads, trails and landings on all of these soils.

Woodland Suitability Group 3

This group consists of seven coarse texture soil types of the Bowie, Norfolk, Ruston, Eustis and Lakeland series. All soils are moderately to rapidly permeable, somewhat excessively to excessively drained, Table 3.

The average site indexes for shortleaf and loblolly pines are 73 and 79, respectively. At 50 years of age, a well-stocked, normally growing stand without intermediate cuttings can be expected to produce per acre about 10,000 board feet for shortleaf and about 11,000 board feet for loblolly. Greater total yields can be expected with periodic thinnings.

Plant competition following the removal of tree overstory or when openings occur in the canopy is rated as moderate. Some competition develops which may delay or retard initial growth and development of a fully-stocked stand.

There are no special equipment limitations on these soils because of the textural characteristics of loamy fine sand and loamy sand.

The expected seedling mortality from plantings is considered to be moderate for all soils in this group. Ordinarily, losses between 25 and 50 per cent of planting seedlings can be expected and replanting will be required. This is the only group of soils within the study that has any degree of seedling mortality problems. These problems are brought about by the sandy nature of the soils with low water-holding capacity.

The windthrow hazards of all soils in the group are considered as slight.

Erosion hazards vary from moderate to very severe for soils of this group. This problem is least severe on the Bowie loamy fine sand. All other soils are considered to have severe to very severe erosion hazards. Special attention should be given to erosion prevention measures in woodland conservation. The location of roads, skidtrails and landings should be given full consideration so that equipment travels across the major slopes.

Woodland Suitability Group 4

There are 12 soil types in this group, of which all are deep, medium textured, somewhat poorly to poorly drained and slowly to very slowly permeable, Table 3.

M-28-59

The average site index is 75 for shortleaf pine and 80 for loblolly pine. On these soils, well-stocked, unthinned stands of shortleaf and loblolly may be expected to produce approximately 11,000 board feet at age 50 years. Total yields can be increased by periodic thinnings.

The degree of plant competition from brush and other plants following the removal of overstory is considered moderate. This is not serious enough to prevent adequate restocking. However, the application of simple management techniques such as seedbed preparation is recommended.

Equipment limitations for this group of soils are severe to moderate. The Almont, Leaf, Caddo, Myatt, and Wrightsville soils in this group have severe limitations because of the clay subsoil and wetness factor, whereas the last four named soils in the group have moderate limitations. Those soils rating severe have problems extending over more than three months of the year. Equipment use damages tree roots and impairs soil structure and stability to the degree indicated by the ratings. Conservation measures should be planned accordingly.

There are no special problems of seedling mortality in plantings on this group of soils.

Three series, Leaf, Pheba, and Stough, have essentially no windthrow problems. The others have a moderate windthrow hazard which might be a problem during periods of excessive wetness and high winds. Some attention should be given to them in conservation treatments involving density control. Grano, 1953 (3), reported that on Caddo silt loam there is a greater windthrow problem for shortleaf than loblolly pine. He indicates that this is most likely due to shallower rooting of shortleaf pine on this soil.

There is no erosion hazard on this group of soils.

Woodland Suitability Group 5

There are 11 soil types included in this group. They are all deep, medium textured, moderately well drained, slowly permeable soils, except Saffell, which is moderately permeable, Table 3.

The average site index of shortleaf pine is 75 and for loblolly 82. Based on normal yield tables, this group of soils will yield per acre 11,000 board feet of shortleaf pine or about 12,500 board feet of loblolly pine at age 50 years (Doyle). This assumes well-stocked, normally growing stands without periodic thinnings. Total yields can be increased by intensive management.

The degree of plant competition is moderate. Plant competition develops on these soils but will not ordinarily prevent adequate stand establishment of desired species. Establishment may be delayed and initial growth rate slowed, thereby delaying the development of a normal, fully stocked stand.

M-28-59

The equipment limitations vary from slight to moderate, with the moderate being confined to the Sawyer series. Some attention should be given to equipment use on the Sawyer soils during a period of less than three months in the winter and spring. During this period, some damage to tree roots or impairment of soil structure and stability may result.

No special problems of seedling mortality in plantings are expected on this group of soils.

The windthrow hazard is considered to be slight. Individual trees can be expected to remain standing when released on all sides.

The erosion hazard is severe to very severe on the Shubuta and Sawyer series. It is moderate to severe on all of the other soils. Special attention should be given to erosion prevention measures in woodland conservation. The location of roads, skidtrails and landings, and the use of equipment up and down slopes should be given full consideration.

Woodland Suitability Group 6

This group consists of 11 soil types and one phase of a soil type. All of the soils are deep and moderately permeable, Table 3.

The average site index of shortleaf pine is 79 and of loblolly 83. From normal yield tables it is estimated that this group of soils will yield per acre approximately 13,000 board feet (Doyle) of either shortleaf pine or loblolly pine at the age of 50 years. Higher total yields in terms of board feet can be attained by making periodic thinnings throughout the 50-year rotation.

The degree of plant competition is moderate but will not ordinarily prevent adequate stand establishment of desired species. The development of a normal, fully stocked stand may be delayed because of some delay in establishment and the slowing of initial growth rate.

Equipment limitations, seedling mortality and windthrow hazards are all considered to be slight and present no special problems.

The erosion hazard is severe to very severe on the Dougherty soils and moderate to severe on the other soils in the group. Attention should be given to erosion prevention measures, especially proper location and maintenance of roads, skidtrails and landings.

Woodland Suitability Group 7

This group contains two tentative soil types, Red Bayou fine sandy loam and Red Bayou very fine sandy loam. These soils are deep, moderately permeable, and well drained, Table 3. It is recognized that the site index on these tentative soil series may be less reliable than on established soil types and that more data and study are necessary on this suitability group.

The average site index of shortleaf pine is 89 and of loblolly pine 91. According to normal yield data these two soil types will yield about 20,000 board feet per acre of shortleaf pine or approximately 17,000 board feet of loblolly pine at age 50 years (Doyle rule). Total yields can be increased by periodic thinnings.

The degree of plant competition is considered moderate. The establishment of both shortleaf and loblolly pine may be delayed and initial growth rate slowed, thereby delaying to some extent the development of a normal, fully stocked stand. Some simple management techniques can be used to minimize the problem of plant competition.

There are no special problems concerning the use of equipment, mortality of seedlings, or windthrow losses.

The erosion hazards of the two soil types are considered moderate to severe. Some attention should be given to erosion prevention in woodland conservation.

Woodland Suitability Group 8

This group contains five soil types of two soil series. They are all moderately well to well drained alluvial soils generally occurring in association with soils in Woodland Suitability Group 9. They are deep, medium textured and moderately permeable soils, Table 3. Shortleaf pine does not occur ordinarily on these soils. Stands were not found for adequate measurements of site index.

The site index of loblolly pine is 91. At age 50 years the loblolly pine will yield on this group of soils about 17,000 board feet per acre (Doyle rule). This assumes well-stocked natural stands without intermediate cuttings. Higher total yields can be attained by intensive management.

The degree of plant competition on these alluvial soils is severe. Natural regeneration cannot be relied upon to provide adequate restocking of loblolly pine. Special management and site preparation treatments such as controlled burning, use of chemical sprays, girdling, planting, and replanting as necessary are generally considerations in planning.

Equipment limitations are not considered important on these soils, but it should be recognized that in many areas these soils occur adjacent to the poorly drained alluvial soils where there is a definite limitation in use of equipment.

Seedling mortality of plantings, windthrow hazards and erosion hazards are considered slight.

Woodland Suitability Group 9

This group is made up of six types of two series, all of which are somewhat poorly to poorly drained, alluvial soils. They are deep, medium textured and slowly permeable, Table 3.

Shortleaf pine does not occur ordinarily on these soils and stands were not found for adequate measurements of site index.

The site index of loblolly pine is 92, the highest site index of the nine woodland suitability groups. The yield of loblolly pine at the age of 50 years from this group of soils will be about 18,000 board feet per acre (Doyle rule). This assumes a well stocked, normally growing stand without periodic thinnings. Intensive management will increase total yields.

The degree of plant competition on these bottomland soils is severe. It is so severe that natural regeneration cannot be relied upon to provide adequate restocking of loblolly pine. Special management and site preparation treatments are generally necessary. This will include controlled burning, use of chemical sprays, girdling, planting and replanting as needed.

Equipment limitations are also considered severe because the soils are poorly drained. Equipment use is restricted during a period greater than three months in the winter and spring because of excess surface water and soil moisture. Under such conditions the use of equipment will cause severe damage to soil structure (puddling of soils) and serious damage to tree roots.

Seedling mortality of plantings, windthrow and erosion hazards are all considered slight.

Economic Evaluation By Woodland Suitability Groups

The woodland site interpretative data and information presented in this paper make economic evaluation possible for each soil and each woodland suitability group in the Forested Coastal Plain. Economists, woodland conservationists and soil scientists have given much consideration to making economic evaluations which will be of value to woodland owners in planning their woodland conservation program. By use of production volumes by site classes and representative cost and sale values, evaluations are possible to compare the potential economic returns of various groups for the production of timber. In addition, a comparison of the potential returns can be made with the potential of other crops on the same site.

Figure 5 provides a basis for making comparisons at future dates, between the value of different capital investment costs, such as stand establishment, and the net returns expected from periodic thinnings and selected crop tree harvesting of loblolly pines.1/ It may be used as a graphical determination of the time lapse before a woodland owner can expect to recover establishment costs from thinnings and thereafter receive a net profit.

1/ Credit is given to M. A. Peters, Woodland Conservationist, and Louis Ledvina, Agricultural Economist, both of the Soil Conservation Service, who are primarily responsible for the development of these economic interpretations.

M-28-59

The solid staggered lines in Figure 5 represent soils of different potential productivity for loblolly pine -- site index ratings. These are given for site index values of 50, 60, 70, 80, and 90. The line for site index 80 can be used to represent woodland suitability groups 1, 3, and 4. By interpolation between the lines representing site index 70 and 80 the information can be made to apply to woodland and suitability group 2. Line for site index 90 can apply to groups 8 and 9.

The smooth curved lines represent capital investment costs per acre, such as those for establishing a stand, carried at 4 per cent compound interest. Six curves, ranging from $5 to $30 per acre, are included for costs representative for the area. By interpolation between lines the cost curves may be used to determine intermediate capital investment costs in the future.

Net returns per acre from a first, second and third thinning operation, together with compound interest on the return, are shown in the solid staggered lines. The returns from the third thinning also include the value of crop trees harvested. The value of all returns has been based on pulpwood at $5 per cord stumpage. Operating costs include: fire protection 5 cents per acre annually; taxes at 25 cents per acre annually; marking costs at $2 per acre for the first thinning, $1.25 per acre for the second thinning and $1 per acre for the third thinning. These have been deducted from the gross returns to get the net values shown in the staggered lines. Volumes used are 85 per cent of the estimated potential maximum -- a calculated amount based on expected results with recommended management.

Values read from the dollar scale on the left of the chart for points where any of the staggered lines cross a particular year, can be compared with a similarly-obtained value from any curved lines crossing the same year, to get the "operator's margin" at any time. Vertical sections of the staggered lines show the net returns per acre from each thinning separately.

An example of the kind of information available from this figure is given as follows: An investment of $10 per acre in establishing a stand on soil of site quality 90 amounts to about $12.50 per acre after 10 years, the time of a first thinning. Net returns from thinning at this time amount to $19 per acre, thus giving the owner a net profit of about $6.50 per acre over the 10-year period. If this same investment is made on a soil of site quality 70, the first thinning is possible at 14 years of age, and the net return is $13 per acre. The original investment costs of $10 has increased due to interest accrual to about $17 per acre. Seven years later a second thinning is possible which furnishes a net return of $29 per acre. The net value of these two thinnings -- $42 (sum of $13 and $29) -- is more than the value of the investment cost at this time (about $22.50) by an amount of about $19.50 which may be considered as net profit from the enterprise.

SUMMARY

Several steps need to be taken before soils information can be readily used by landowners. One of these, of course, is the soil map which shows where different kinds of soils are located. Another is soil interpretations to show the relationship between soils and a particular use.

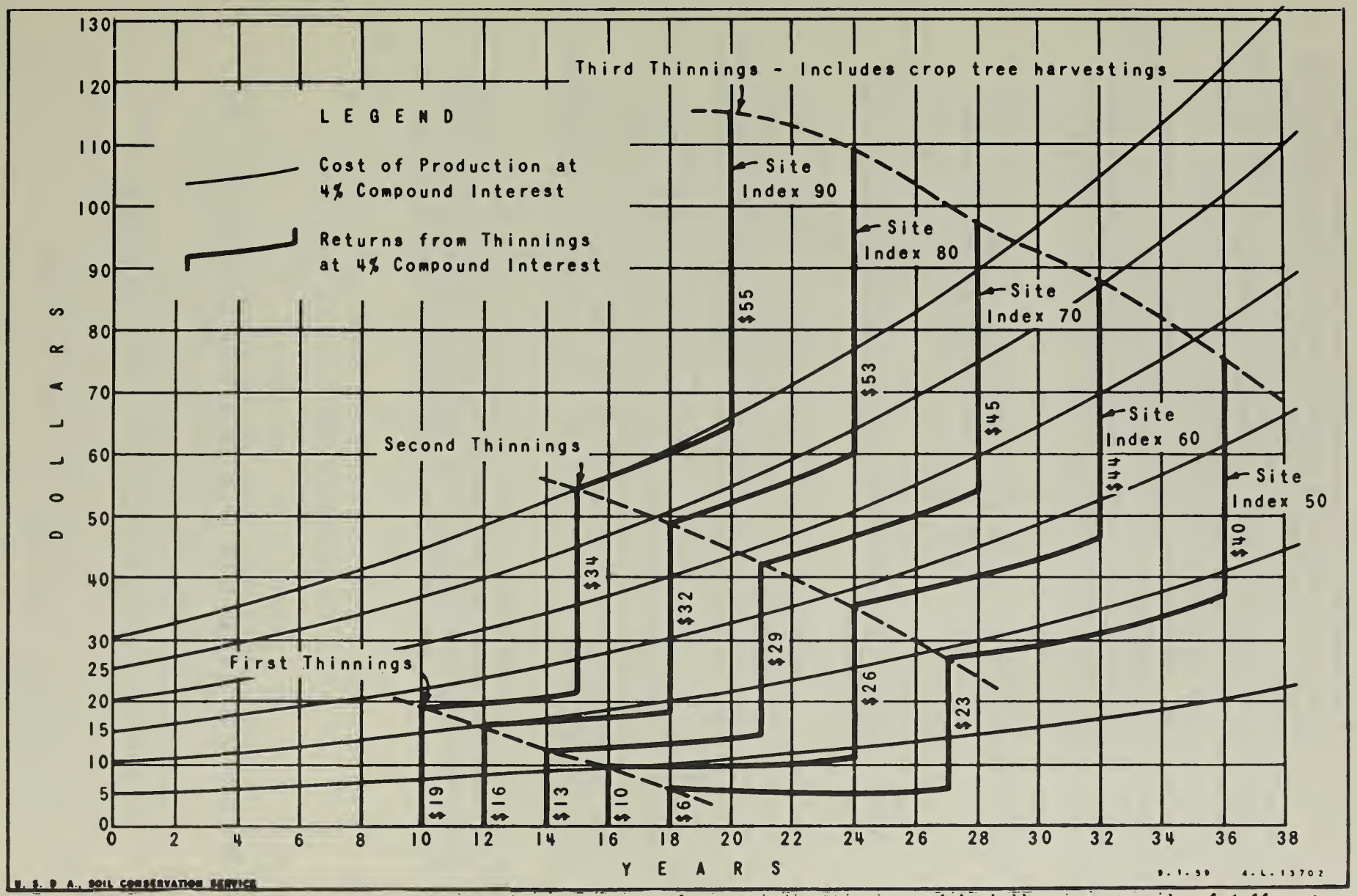

Figure 5. Comparison between costs of production and returns from periodic thinnings of loblolly pine on soils of different site index.

Soil maps for approximately 3,900,000 acres have been made since 1935 in the Forested Coastal Plain Area of Arkansas -- about 54 per cent of the total area. Approximately 71 per cent of this surveyed area is forested and is expected to continue to be used for wood crops. It is timely, therefore, that systematic efforts be given to develop soil interpretations for this woodland area. This report gives these soil interpretations.

Items of woodland use and treatment correlated with soils in this report are: potential soil productivity for shortleaf and loblolly pine; plant competition or brush encroachment problems; limitations on equipment used in wood crop production; seedling mortality of planted stock; hazards due to windthrow; and hazards due to soil erosion.

Potential soil productivity ratings were based on field studies on locations representing 67 different soil types and phases and 33 soil series. A total of 283 forest stands were studied including 108 stands of shortleaf and 175 stands of loblolly pine. A total of 817 trees were measured for site index, 326 of these were shortleaf and 491 were loblolly pine. Detailed information about the soils, their location, physiographic characteristics, climate, etc., for these plot locations have been permanently recorded in this report.

The major soils shown on soil maps of the area have been "rated" for potential soil productivity and other items of woodland use and management in such a way as to distinguish between the different kinds and intensities of conservation treatments that may be employed in woodland use. Soils that were rated the same have been assembled into nine woodland suitability groupings to simplify the presentation of information about them. Each group has been discussed in detail, pointing out the capability, limitations and hazards involved in woodland production. This furnishes a basis to guide woodland owners in making alternative choices of their soils for the production of wood crops and to choose the best combination of conservation practices.

Based on potential soil productivity ratings and calculated costs and returns from recommended woodland conservation, some economic interpretations have been presented. These apply to woodland suitability groupings of soils. They are an additional source of information to assist woodland owners.

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M-28-59

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M. 28. 59

APPENDIX

INDEX

M-28-59

APPENDIX A. SOIL CORRELATION PLOT DATA

Appendix Tables 1 and 2 present the soil-woodland site correlation plot data for shortleaf pine and loblolly pine in the Forested Coastal Plain Area of southern Arkansas. The information includes records of data from each site studied, consisting of soil type, county name, plot number, slope class, erosion class, aspect, plot position (upper, middle, or lower slope), frost free days, average annual precipitation, average growing season precipitation, number of trees measured, average site index, average site index all plots, standard deviation, variation coefficient, average height of trees in plot, average age of trees in plot, and average diameter of trees in plot.

M-28-59

APPENDIX TABLE I. SOIL WOODLAND SITE CORRELATION PLOT DATA FOR SHORTLEAF PINE IN FORESTED COASTAL PLAIN AREA OF SOUTHERN ARKANSAS

SOIL TYPE 1/		COUNTY AND PLOT		SLOPE CLASS	EROSION CLASS	ASPECT	PLOT POSITION	F.F. 2/ DAYS	AVE. PRECIPITATION		NO. OF TREES MEASURED	AVE. SITE INDEX	AVE. SITE INDEX ALL PLOTS	STANDARD DEVIATION	VARIATION COEFFICIENT	AVE. HT. OF TREES IN PLOT	AVE. AGE OF TREES IN PLOT	AVE. DIAM. OF TREES IN PLOT
									ANNUAL	GROWING SEASON								
Almont	sil	Miller	15	A	1	-	-	233	51	32	4	65				60	46	12
	sil	Miller	2	B	1	-	-	233	51	32	4	73	69	-	-	76	55	14
Amite	fsl	Nevada	16	B	1	S	Upper	229	52	35	2	75	75	-	-	75	52	18
Amite	sl	Nevada	8	B	1	E	Upper	229	52	35	2	81	81	-	-	82	52	15
Boswell	fsl	Little River	20	B	2	NW	Middle	226	44	29	5	75				76	51	12
	fsl	Columbia	23A	C	2	E	Middle	236	48	29	2	74				76	52	12
	fsl	Bradley	41	B	1	N	Middle	225	52	33	3	79				60	31	12
	fsl	Bradley	37	C	1	-	Middle	225	52	33	4	61	72	8	11	65	59	12
Boswell	gfsl	Bradley	36a	B	1	-	Middle	225	52	33	4	68				69	54	13
	gfsl	Little River	18	B	2	S	Middle	226	44	29	5	68	68	-	-	54	33	9
Bowie	fsl	Columbia	11	B	1	W	Upper	236	48	29	2	87				74	37	16
	fsl	Ouachita	8	B	1	S	Upper	224	50	30	2	74	81	-	-	58	32	14
Bowie	vfsl	Little River	16A	B	2	S	Middle	226	44	29	5	81	81	-	-	86	56	14
Bowie	lfs	Nevada	5	C	3	N	Upper	229	51	33	2	75				63	35	15
	lfs	Ouachita	16	C	2	E	Lower	224	50	30	2	74				65	39	13
	lfs	Union	7	D	2	N	Middle	241	48	31	2	77	75	2	3	75	47	13
Caddo	vfsl	Bradley	33a	A	1	-	-	225	52	33	4	72				73	51	12
	vfsl	Orew	6a	A	1	SE	Middle	225	52	33	3	80				85	56	16
	vfsl	Ouachita	33	A	1	-	-	224	50	30	3	70	74	5	7	68	48	14
Dougherty	fsl	Little River	24A	B	2	S	Upper	226	44	29	4	75	75	-	-	65	38	12
Eustis	lfs	Ouachita	17	B	1	N	Lower	224	50	30	3	77	77	-	-	79	52	13
Eustis	ls	Nevada	9	B	1	NW	Lower	229	52	35	2	72				60	32	14
	ls	Union	10	B	1	N	Upper	241	51	31	2	74				59	33	13
	ls	Union	4	F	1	NE	Middle	241	51	31	2	72	73	1	1	72	50	14
Kirvin	fsl	Grant	38	C	1	S	Upper	217	52	32	4	72				83	68	16
	fsl	Ouachita	40	E	1	E	Upper	224	50	30	2	83				70	38	13
	fsl	Ouachita	45	C	1	W	-	224	50	30	2	75	77	6	8	64	38	13
Lakeland	ls	Columbia	2	E	1	S	Upper	236	48	29	2	68				74	60	17
	ls	Columbia	6	C	1	N	Upper	236	48	29	2	67				58	39	13
	ls	Columbia	18	C	1	W	Upper	236	48	29	2	69				66	45	11
	ls	Ouachita	14	D	1	E	Lower	224	50	30	2	79				74	43	12
	ls	Ouachita	41	E	1	W	Upper	224	50	30	2	62	69	6	9	62	52	12
Myatt	vfsl	Orew	7b	A	1	S	Middle	225	52	33	3	75	75	-	-	66	40	15
Myatt	sil	Ouachita	26	A	1	-	-	224	50	30	2	77				67	39	15
	sil	Ouachita	29	A	1	-	-	224	50	30	3	77	77	-	-	84	60	16
Norfolk	fsl	Nevada	15	F	1	E	Lower	229	52	35	2	79				68	38	12
	fsl	Ouachita	42	C	1	W	Lower	224	50	30	2	80				72	40	15
	fsl	Columbia	31	B	1	W	Lower	224	50	30	2	78	79	1	1	60	31	16

1/ Soil type abbreviated. Abbreviations are explained in Table 1 of report.

2/ Frost-free days.

M-28-59

APPENDIX TABLE I. SOIL WOODLAND SITE CORRELATION PLOT DATA FOR SHORTLEAF PINE IN FORESTED COASTAL PLAIN AREA OF SOUTHERN ARKANSAS-CONT.

SOIL TYPE[1]		COUNTY AND PLOT		SLOPE CLASS	EROSION CLASS	ASPECT	PLOT POSITION	F.F.[2] DAYS	AVE. PRECIPITATION		NO. OF TREES MEASURED	AVE. SITE INDEX	AVE. SITE INDEX ALL PLOTS	STANDARD DEVIATION	VARIATION COEFFICIENT	AVE. HT. OF TREES IN PLOT	AVE. AGE OF TREES IN PLOT	AVE. DIAM. OF TREES IN PLOT
									ANNUAL	GROWING SEASON								
Norfolk	sl	Ouachita	8	B	1	SW	Upper	224	50	30	2	84				69	34	13
	sl	Ouachita	6	C	1	N	Lower	224	50	30	2	80				62	31	14
	sl	Grant	42	B	1	-	Upper	217	53	35	4	72	79	6	8	83	67	17
Pheba	fsl	Saline	52	A	1	-	-	241	46	30	2	74	74	-	-	78	57	17
Pheba	vfsl	Bradley	19	A	1	-	-	225	52	33	2	83				86	55	14
	vfsl	Cleveland	15	A	1	-	Lower	217	49	31	2	81	82	-	-	74	42	16
Prentiss	vfsl	Bradley	26	B	1	E	Middle	225	52	33	2	74				71	48	13
	vfsl	Bradley	40a	C	1	-	Middle	225	52	33	3	80				95	71	16
	vfsl	Ouachita	28	A	1	-	-	224	50	30	2	76	77	3	4	63	36	16
Red Bayou	fsl	Little River	12B	B	1	N	Upper	226	44	29	2	87				76	39	11
	fsl	Little River	22A	B	2	S	Middle	226	44	29	4	91	89	-	-	82	41	14
Ruston	fsl	Orew	13	B	2	-	Upper	225	52	33	4	84				87	53	14
	fsl	Bradley	34	B	1	-	Middle	225	52	33	4	77				79	53	13
	fsl	Hempstead	15A	O	2	W	Lower	231	52	33	5	77				84	61	15
	fsl	Ouachita	30	C	1	E	Upper	224	50	30	2	70				57	35	13
	fsl	Lafayette	15	B	2	W	Upper	224	50	30	2	73	76	5	7	56	31	12
Ruston	ls	Union	2	O	2	SW	Upper	241	52	31	2	75				63	35	16
	ls	Nevada	22	B	1	W	Lower	224	50	30	3	80	78	-	-	63	31	11
Saffell	fsl	Pike	7	B	1	-	Upper	219	46	29	4	66				66	50	13
	fsl	Pike	8	B	2	SE	Upper	219	46	29	5	76				78	54	14
	fsl	Pike	9A	C	2	W	Upper	219	46	29	4	77				77	50	14
	fsl	Pike	10A	B	1	-	Upper	219	46	29	4	72				81	62	15
	fsl	Pike	22	B	1	-	Upper	219	46	29	4	73	73	4	5	71	48	13
Saffell (Upper slope phase)	gfsl	Pike	13	E	1	-	Upper	219	46	29	4	68				65	46	10
	gfsl	Pike	14	C	2	-	Upper	219	46	29	6	65				63	47	12
	gfsl	Pike	15	C	1	-	Upper	219	46	29	4	69				62	41	10
	gfsl	Pike	18A	B	2	-	Upper	219	46	29	7	67				68	50	13
	gfsl	Pike	19A	E	1	-	Upper	219	46	29	5	70	68	2	3	72	52	14
Saffell (Lower slope phase)	gfsl	Pike	16	E	1	N	Lower	219	46	29	4	79				80	52	13
	gfsl	Pike	17A	E	1	W	Lower	219	46	29	5	80				81	51	15
	gfsl	Pike	21A	E	1	W	Lower	219	46	29	4	87	82	4	5	83	44	14
Savannah	fsl	Miller	5	B	1	-	-	233	51	32	4	79				85	58	14
	fsl	Cleveland	18	C	1	N	Upper	217	49	31	2	78				79	51	14
	fsl	Bradley	32	B	1	-	Upper	225	52	33	4	71				77	62	15
	fsl	Bradley	32a	B	1	N	Lower	225	52	33	4	77				77	50	15
	fsl	Lafayette	14	B	1	W	Upper	223	47	30	3	82				85	55	14
	fsl	Ouachita	43	O	2	N	Lower	224	50	30	2	70	76	5	7	61	37	14

1/ Soil type abbreviated. Abbreviations are explained in Table 1 of report.

2/ Frost-free days.

M-28-59

APPENDIX TABLE I. SOIL WOODLAND SITE CORRELATION PLOT DATA FOR SHORTLEAF PINE IN FORESTED COASTAL PLAIN AREA OF SOUTHERN ARKANSAS-CONT.

SOIL TYPE [1]		COUNTY AND PLOT		SLOPE CLASS	EROSION CLASS	ASPECT	PLOT POSITION	F.F. [2] DAYS	AVE. PRECIPITATION ANNUAL	AVE. PRECIPITATION GROWING SEASON	NO. OF TREES MEASURED	AVE. SITE INDEX	AVE. SITE INDEX ALL PLOTS	STANDARD DEVIATION	VARIATION COEFFI-CIENT	AVE. HT. OF TREES IN PLOT	AVE. AGE OF TREES IN PLOT	AVE. DIAM. OF TREES IN PLOT
Savannah	vfsl	Ouachita	47	B	1	W	Upper	224	50	30	2	70	70	-	-	67	51	12
Sawyer	fsl	Cleveland	19	B	1	N	Lower	217	49	31	4	82				85	55	13
	fsl	Cleveland	21	D	1	N	Middle	217	49	31	5	77				81	53	14
	fsl	Grant	40	C	1	SW	Middle	217	53	35	4	76				88	70	15
	fsl	Miller	18	B	1	W	Middle	233	51	32	2	78				87	62	18
	fsl	Miller	17A	B	2	W	Middle	233	51	32	2	71				67	45	11
	fsl	Miller	7	B	2	-	-	233	51	32	4	77				80	51	11
	fsl	Saline	49	A	1	-	-	241	46	30	2	71	76	4	5	65	42	14
Sawyer	vfsl	Cleveland	17	B	1	N	Lower	217	49	31	2	77	77	-	-	74	47	11
Shubuta	fsl	Grant	28	C	1	S	Upper	217	53	32	2	73				75	52	15
	fsl	Lafayette	11A	C	2	N	Lower	223	46	31	3	73				63	38	12
	fsl	Saline	51	B	1	-	Upper	241	46	30	2	70				63	41	12
	fsl	Saline	60	C	1	S	Middle	241	46	30	2	70				68	48	17
	fsl	Saline	62	D	1	N	Middle	241	46	30	4	75				76	51	13
	fsl	Ouachita	24	C	1	S	Upper	224	50	30	2	64	71	4	6	62	51	13
Stough	fsl	Little River	19	B	2	S	Upper	226	44	29	4	82				64	30	11
	fsl	Hempstead	16A	B	2	W	Middle	241	52	33	3	81				78	49	14
	fsl	Drew	11	A	1	-	-	225	52	33	4	76	80	3	4	76	49	14
Stough	vfsl	Grant	33	A	1	S	Upper	217	53	35	2	76				73	48	15
	vfsl	Ouachita	18a	A	1	-	Lower	224	50	30	2	71				69	48	13
	vfsl	Ouachita	21	A	1	-	-	224	50	30	2	70				72	52	12
	vfsl	Bradley	31	B	1	N	Upper	225	52	33	4	79	73	3	4	58	32	12
Susquehanna	vfsl	Dallas	15	B	1	E	Middle	217	50	32	2	61				69	64	15
	vfsl	Dallas	13	B	1	S	Middle	217	50	32	2	62				61	47	11
	vfsl	Drew	4	B	1	E	Middle	225	52	33	2	68				82	75	13
	vfsl	Drew	2	D	1	NW	Middle	225	52	33	4	71	66	5	8	70	49	11
Tilden	fsl	Drew	9	B	1	N	Upper	225	52	32	4	81	81	-	-	74	42	15
Wilcox	slc	Bradley	39	B	1	E	Middle	225	52	33	3	74				68	47	14
	slc	Bradley	42	A	1	S	Middle	225	52	33	3	70	71	-	-	72	54	12
Wrightsville	slc	Miller	1	A	1	-	-	233	51	32	4	60				68	64	13
	slc	Miller	14	A	1	-	-	233	51	32	4	52	56	-	-	52	49	12
Wrightsville	sil	Columbia	30	A	1	-	-	236	48	29	2	68				72	55	18
	sil	Columbia	29	A	1	-	-	236	48	29	2	72	70	-	-	79	60	16

1/ Soil type abbreviated. Abbreviations are explained in table 1 of report.

2/ Frost-free days.

APPENDIX TABLE 2. SOIL WOODLAND SITE CORRELATION PLOT DATA FOR LOBLOLLY PINE IN FORESTED COASTAL PLAIN AREA OF SOUTHERN ARKANSAS

SOIL TYPE [1]		COUNTY AND PLOT		SLOPE CLASS	EROSION CLASS	ASPECT	PLOT POSITION	F.F.[2] DAYS	AVE. PRECIPITATION		NO. OF TREES MEASURED	AVE. SITE INDEX	AVE. SITE INDEX ALL PLOTS	STANDARD DEVIATION	VARIATION COEFFICIENT	AVE. HT. OF TREES IN PLOT	AVE. AGE. OF TREES IN PLOT	AVE. DIAM. OF TREES IN PLOT
									ANNUAL	GROWING SEASON								
Almont	sil	Miller	2A	B	1	-	-	233	51	32	4	77	77	-	-	74	47	13
Amite	fsl	Nevada	17	B	1	N	Upper	229	52	35	2	74	74	-	-	68	44	15
Bibb	vfsl	Dallas	6	A	1	-	-	217	50	32	2	92	92	-	-	85	40	16
Bibb	sil	Bradley	6	A	1	-	-	225	52	33	2	90				84	43	23
	sil	Bradley	8	A	1	-	-	225	52	33	2	84				85	51	12
	sil	Cleveland	2	A	1	-	-	217	52	33	2	100				105	55	22
	sil	Cleveland	7	A	1	-	-	217	49	31	2	81				79	48	16
	sil	Cleveland	9	A	1	-	-	217	49	31	2	93				74	31	12
	sil	Cleveland	10	A	1	-	-	217	49	31	2	86	89	7	8	86	52	19
Boswell	fsl	Columbia	23	C	2	E	Middle	236	48	29	2	80				81	51	16
	fsl	Drew	6	C	1	W	Upper	225	52	33	5	80				80	50	16
	fsl	Bradley	38	B	1	-	Middle	225	52	33	4	79				93	72	18
	fsl	Columbia	28	E	1	E	Upper	236	48	29	2	78	79	1	1	71	40	14
Boswell	gfsl	Grant	29	B	1	SW	Upper	217	50	32	2	69				74	63	17
	gfsl	Grant	11	D	1	S	Middle	217	50	32	2	78				63	32	10
	gfsl	Bradley	36b	B	1	-	Middle	225	52	33	3	79	75	6	8	81	58	11
Bowie	fsl	Columbia	24	C	2	S	Middle	236	48	29	2	89				72	32	18
	fsl	Columbia	25	C	2	SW	Upper	236	48	29	2	78				65	34	17
	fsl	Columbia	3	B	1	E	Lower	236	48	29	2	78				74	45	18
	fsl	Columbia	10	B	1	W	Upper	236	48	29	2	87				73	37	14
	fsl	Miller	8	C	1	S	Middle	233	51	32	4	84				85	52	16
	fsl	Nevada	14	B	1	S	Upper	229	52	35	2	85	84	5	6	84	50	15
Bowie	vfsl	Little River	16	B	1	S	Middle	226	44	29	5	85	85	-	-	89	55	15
Bowie	sl	Columbia	15	C	2	SW	Lower	236	48	29	2	91	91	-	-	78	36	17
Bowie	lfs	Columbia	25A	C	2	SW	Upper	236	48	29	2	81				83	53	14
	lfs	Ouachita	15	C	2	E	Lower	224	51	30	2	79	80	-	-	72	40	13
Cahaba	fsl	Ouachita	31	C	2	S	Middle	224	51	30	3	81	81	-	-	63	29	13
Caddo	vfsl	Nevada	1	A	1	S	Lower	229	52	35	3	74				72	47	15
	vfsl	Drew	6b	A	1	SE	Middle	225	52	33	3	84				87	56	19
	vfsl	Bradley	33b	A	1	S	-	225	52	33	2	85				82	47	15
	vfsl	Lafayette	13	A	1	-	Upper	223	47	30	3	89	83	6	7	88	48	17
Dougherty	fsl	Little River	24	B	2	S	Upper	226	44	29	6	76				66	37	11
	fsl	Little River	23	D	3	N	Middle	226	44	29	6	81	79	-	-	66	33	14
Dougherty	vfsl	Lafayette	8	B	2	SW	Lower	223	47	30	2	80	80	-	-	67	34	14
Eustis	ls	Ouachita	4	B	1	N	Lower	224	50	30	2	78				76	47	17
	ls	Ouachita	31A	C	1	S	Upper	224	50	30	2	78				65	35	17
	ls	Ouachita	32A	B	1	NW	Upper	224	50	30	2	71				48	24	14
	ls	Union	3	F	1	N	Upper	241	52	31	2	78				77	48	16
	ls	Ouachita	44	D	1	SW	Upper	224	52	31	3	79	77	3	4	64	32	19

1/ Soil type abbreviated. Abbreviations are explained in Table 1 of report.

2/ Frost-free days.

M-26-59

APPENDIX TABLE 2. SOIL WOODLAND SITE CORRELATION PLOT DATA FOR LOBLOLLY PINE IN FORESTED COASTAL PLAIN AREA OF SOUTHERN ARKANSAS-CONT.

SOIL TYPE 1/		COUNTY AND PLOT		SLOPE CLASS	EROSION CLASS	ASPECT	PLOT POSITION	F.F. 2/ DAYS	AVE. PRECIPITATION		NO. OF TREES MEASURED	AVE. SITE INDEX	AVE. SITE INDEX ALL PLOTS	STANDARD DEVIATION	VARIATION COEFFICIENT	AVE. HT. OF TREES IN PLOT	AVE. AGE. OF TREES IN PLOT	AVE. DIAM. OF TREES IN PLOT
									ANNUAL	GROWING SEASON								
Iuka	fsl	Columbia	12	A	1	-	-	236	48	29	2	88				89	53	16
	fsl	Hempstead	12	A	1	-	-	231	52	32	4	83				84	40	19
	fsl	Miller	9	A	1	-	-	233	51	32	4	95				96	52	24
	fsl	Nevada	12	A	1	-	-	229	52	35	2	88				93	58	19
	fsl	Nevada	11	A	1	-	-	229	52	35	2	85	88	9	10	78	40	19
Iuka	vfsl	Howard	6	A	1	-	-	227	49	32	4	83	83	-	-	69	35	13
Iuka	sil	Columbia	19	A	1	-	-	236	48	29	2	90	90	-	-	97	62	19
Izagora	vfsl	Nevada	6	B	2	W	Upper	229	52	35	2	70	70	-	-	75	60	15
Izagora	sil	Nevada	21	A	1	-	-	229	52	35	2	78	78	-	-	73	45	19
Kalmia	fsl	Ouachita	32	A	1	-	-	224	50	30	2	79	79	-	-	61	29	15
Kirvin	fsl	Ouachita	12	B	1	E	Upper	224	51	30	2	73				62	35	14
	fsl	Nevada	20	O	1	N	Upper	229	52	35	3	62	68	-	-	65	59	13
Lakeland	lfs	Hempstead	5	B	2	-	-	231	52	33	4	81	81	-	-	80	50	12
Lakeland	ls	Ouachita	13	O	1	E	Lower	224	50	30	2	83	83	-	-	79	44	16
Leaf	fsl	Bradley	33	B	1	SE	Lower	225	52	33	4	83	83	-	-	86	57	19
Leaf	sil	Nevada	19	B	1	W	Upper	229	52	35	2	79	79	-	-	73	42	12
Mantachie	fsl	Columbia	20	A	1	-	-	236	48	29	2	92				91	50	18
	fsl	Columbia	13	A	1	-	-	236	48	29	2	104				93	39	17
	fsl	Columbia	27	A	1	-	-	236	48	29	2	90				83	43	21
	fsl	Nevada	13	A	1	-	-	229	52	35	2	89				76	37	14
	fsl	Saline	21	A	1	-	-	241	50	31	2	91	93	6	6	67	26	11
Mantachie	sl	Saline	67	A	1	-	-	241	50	31	3	95	95	-	-	92	46	19
Mantachie	vfsl	Little River	17	A	1	-	-	226	44	29	5	94	94	-	-	95	51	22
Mantachie	sil	Lafayette	4	A	1	-	-	223	47	32	2	98	98	-	-	83	35	17
Myatt	fsl	Bradley	5	A	1	-	-	225	52	32	2	80				84	58	12
	fsl	Orew	8	A	1	-	-	225	52	32	4	76	78	-	-	77	51	15
Myatt	vfsl	Bradley	28	A	1	-	-	225	52	33	2	80				82	53	16
	vfsl	Calhoun	4	A	1	-	-	224	51	32	2	82				84	54	14
	vfsl	Cleveland	1	A	1	-	-	217	52	33	2	80				81	52	16
	vfsl	Dallas	16	A	1	-	-	217	50	32	4	76				75	47	13
	vfsl	Jefferson	1	A	1	-	-	228	51	31	2	87				96	69	18
	vfsl	Orew	7a	A	1	S	Middle	225	52	32	4	80				69	38	14
	vfsl	Orew	8a	A	1	-	Middle	225	52	32	3	84	81	4	5	87	57	15
Myatt	sil	Grant	41	A	1	-	-	217	52	35	5	72	72	-	-	64	40	13
Norfolk	fsl	Columbia	1	C	2	E	Lower	236	48	29	2	79				79	50	17
	fsl	Hempstead	2	C	2	SE	-	231	52	33	4	80				62	30	12
	fsl	Saline	61	C	1	NW	Middle	241	49	31	5	78				63	32	12
	fsl	Union	8	C	2	NE	Upper	241	52	31	2	85				71	34	12
	fsl	Ouachita	35	B	1	E	Upper	224	51	30	2	77				63	33	13
	fsl	Ouachita	36	B	1	S	Upper	224	51	30	2	92	82	6	7	84	39	14

1/ Soil type abbreviated. Abbreviations are explained in Table 1 of report.

2/ Frost-free days.

M-28-59

APPENDIX TABLE 2. SOIL WOODLAND SITE CORRELATION PLOT DATA FOR LOBLOLLY PINE IN FORESTED COASTAL PLAIN AREA OF SOUTHERN ARKANSAS-CONT.

SOIL TYPE 1/		COUNTY AND PLOT		SLOPE CLASS	EROSION CLASS	ASPECT	PLOT POSITION	F.F.2/ DAYS	AVE. PRECIPITATION		NO. OF TREES MEASURED	AVE. SITE INDEX	AVE. SITE INDEX ALL PLOTS	STANDARD DEVIATION	VARIATION COEFFICIENT	AVE. HT. OF TREES IN PLOT	AVE. AGE. OF TREES IN PLOT	AVE. DIAM. OF TREES IN PLOT
									ANNUAL	GROWING SEASON								
Norfolk	sl	Ouachita	5	B	1	N	Lower	224	51	30	2	81				67	33	17
	sl	Union	8	B	2	N	Lower	241	52	31	2	81	81	-	-	67	33	13
Norfolk	lfs	Lafayette	12	B	1	W	Upper	223	46	31	2	79	79	-	-	76	46	14
Ochlockonee	fsl	Hempstead	11	A	1	-	-	231	52	33	4	96				84	37	19
	fsl	Howard	19	A	1	-	-	227	49	33	4	90				93	55	19
	fsl	Miller	6	A	1	-	-	233	51	32	4	103	96	7	7	104	51	17
Ochlockonee	sil	Bradley	34	B	1	-	-	225	52	33	4	96	96	-	-	98	52	16
Pheba	fsl	Cleveland	22	A	1	-	-	217	49	31	4	79				82	55	16
	fsl	Cleveland	23	A	1	-	-	217	49	31	4	84				91	62	16
	fsl	Orew	7	A	1	-	-	225	52	33	4	83				84	52	20
	fsl	Grant	37	A	1	-	-	217	50	32	5	82				78	46	18
	fsl	Nevada	2	A	1	-	-	229	49	29	3	73				74	51	11
	fsl	Ouachita	19	A	1	-	-	224	50	30	2	77	80	4	5	69	42	17
Pheba	vfsl	Calhoun	1	A	1	-	-	224	50	30	2	73				74	53	13
	vfsl	Calhoun	2	A	1	-	-	224	50	30	2	75				78	55	13
	vfsl	Cleveland	5	A	1	-	-	217	49	31	2	80				67	34	12
	vfsl	Cleveland	14	A	1	-	-	217	49	31	2	82				74	41	14
	vfsl	Dallas	11	A	1	-	-	217	50	32	2	85				78	48	15
	vfsl	Dallas	3	A	1	-	-	217	50	32	2	75				76	49	14
	vfsl	Grant	4	A	1	-	-	217	50	32	2	86				65	28	10
	vfsl	Saline	53	A	1	-	-	241	50	32	2	78	80	5	6	74	44	20
Prentiss	fsl	Ouachita	37	B	2	E	Upper	224	50	30	2	81				68	34	19
	fsl	Ouachita	38	B	1	W	Upper	224	50	30	2	87				71	33	15
	fsl	Nevada	18	B	1	W	Upper	229	52	35	2	76	81	6	7	75	50	17
Prentiss	vfsl	Bradley	25	B	1	W	Middle	225	52	33	2	80				76	44	13
	vfsl	Bradley	40b	C	1	E	Middle	225	52	33	4	88	84	-	-	98	71	19
Red Bayou	fsl	Little River	3	B	1	S	Upper	226	44	29	2	91				95	56	20
	fsl	Little River	12A	B	1	N	Upper	226	44	29	2	90	91	-	-	80	38	13
Red Bayou	vfsl	Little River	22	B	1	S	Middle	226	44	29	5	93	93	-	-	85	41	17
Ruston	fsl	Hempstead	15	D	2	W	Lower	231	52	33	4	85				76	39	15
	fsl	Dallas	8	B	2	E	Upper	217	50	32	2	77				63	33	12
	fsl	Dallas	7	B	2	E	Lower	217	50	32	2	88				68	30	13
	fsl	Orew	12	B	2	-	Upper	225	52	33	5	82	83	5	6	84	53	14
Ruston	ls	Union	1	D	2	SW	Upper	241	52	31	2	85	85	-	-	70	33	16
Saffell	fsl	Pike	12	B	1	S	Upper	219	46	29	4	78				78	50	17
	fsl	Pike	10	B	1	S	Upper	219	46	29	4	82				89	62	18
	fsl	Pike	9	B	1	W	Upper	219	46	29	4	84				84	51	14
	fsl	Pike	11	B	1	-	Upper	219	46	29	4	77	80	3	4	78	55	16
Saffell	gfsl	Pike	18	B	2	-	Upper	219	46	29	4	70				68	46	12
(Upper slope phase)	gfsl	Pike	19	E	1	W	Upper	219	46	29	5	72	71	-	-	72	51	14

1/ Soil type abbreviated. Abbreviations are explained in Table 1 of report.

2/ Frost-free days.

M.28.59

APPENDIX TABLE 2. SOIL WOODLAND SITE CORRELATION PLOT DATA FOR LOBLOLLY PINE IN FORESTED COASTAL PLAIN AREA OF SOUTHERN ARKANSAS-CONT.

SOIL TYPE 1/		COUNTY AND PLOT		SLOPE CLASS	EROSION CLASS	ASPECT	PLOT POSITION	F.F. 2/ DAYS	AVE. PRECIPITATION ANNUAL	AVE. PRECIPITATION GROWING SEASON	NO. OF TREES MEASURED	AVE. SITE INDEX	AVE. SITE INDEX ALL PLOTS	STANDARD DEVIATION	VARIATION COEFFICIENT	AVE. HT. OF TREES IN PLOT	AVE. AGE. OF TREES IN PLOT	AVE. DIAM. OF TREES IN PLOT
Saffell	gfsl	Calhoun	5a	C	1	S	Middle	219	46	29	3	80				85	57	14
(Lower	gfsl	Pike	17	E	1	W	Lower	219	46	29	4	81				82	52	17
slope	gfsl	Pike	20	C	1	W	Lower	219	46	29	3	86				88	52	17
phase)	gfsl	Pike	21	E	1	W	Lower	219	46	29	6	90	84	5	6	88	47	16
Savannah	fsl	Bradley	13	B	1	NE	Middle	225	52	33	2	80				81	53	12
	fsl	Bradley	29	B	1	W	Lower	225	52	33	2	77				77	52	13
	fsl	Bradley	31	B	1	-	Upper	225	52	33	3	76				75	51	17
	fsl	Cleveland	4	B	1	NW	Middle	217	51	32	2	75				76	53	15
	fsl	Grant	36	A	1	-	-	217	53	34	4	85				86	51	21
	fsl	Saline	63	B	1	-	Upper	241	46	30	4	76	78	4	5	70	41	17
Savannah	vfsl	Ashley	1	B	1	E	Lower	227	52	31	2	84	84	-	-	80	45	15
Sawyer	fsl	Cleveland	20	B	1	N	Middle	217	49	31	4	80				88	66	16
	fsl	Grant	39	C	1	SW	Middle	217	50	32	4	84				93	69	17
	fsl	Miller	18A	B	1	W	Middle	233	51	32	2	88				95	63	19
	fsl	Miller	17	B	2	W	Middle	233	51	32	2	81	83	5	6	77	45	12
Sawyer	vfsl	Ashley	3	B	1	E	Lower	227	52	31	2	90				70	30	18
	vfsl	Bradley	20	B	1	-	Upper	225	52	33	3	82				86	59	14
	vfsl	Cleveland	13	B	1	NW	Middle	217	50	32	2	79				81	55	14
	vfsl	Oallas	9	B	1	NW	Middle	217	50	32	3	81				99	72	17
	vfsl	Drew	5	B	1	W	Lower	225	52	33	2	89	84	5	6	97	65	20
Shubuta	fsl	Lafayette	11	C	2	N	Lower	223	46	31	2	85				75	38	14
	fsl	Lafayette	13	C	2	N	Middle	223	46	31	2	87				69	31	16
	fsl	Ouachita	25	C	1	S	Upper	224	50	30	2	73				66	42	12
	fsl	Ouachita	46	C	2	W	Upper	224	50	30	2	81	82	6	7	72	38	13
Shubuta	gfsl	Saline	59	B	1	NW	Upper	241	52	32	2	83	83	-	-	86	55	17
Stidham	fsl	Lafayette	2	B	1	E	Upper	223	46	31	2	78	78	-	-	61	31	14
Stough	fsl	Drew	10	A	1	-	-	225	52	33	4	84				83	49	18
	fsl	Hempstead	16	B	2	W	Middle	231	52	32	5	81	83	-	-	79	47	14
Stough	vfsl	Bradley	14	A	1	-	-	225	52	33	2	75				68	41	13
	vfsl	Bradley	27	A	1	N	Lower	225	52	33	2	88				88	51	19
	vfsl	Grant	34	A	1	S	Upper	217	50	32	2	86				80	42	16
	vfsl	Ouachita	20	A	1	-	-	224	50	30	3	76				72	46	13
	vfsl	Ouachita	22	A	1	-	-	224	50	30	2	77				65	35	15
	vfsl	Ouachita	18	A	1	-	Lower	224	50	30	2	80				78	48	12
	vfsl	Little River	21	B	1	-	-	226	44	29	3	81	80	5	6	68	35	16
Susquehanna	fsl	Drew	1	O	1	NW	Middle	225	52	33	6	74	74	-	-	74	51	14

1/ Soil type abbreviated. Abbreviations are explained in Table 1 of report.

2/ Frost-free days.

M-28-59

APPENDIX TABLE 2. SOIL WOODLAND SITE CORRELATION PLOT DATA FOR LOBLOLLY PINE IN FORESTED COASTAL PLAIN AREA OF SOUTHERN ARKANSAS-CONT.

SOIL TYPE 1/		COUNTY AND PLOT		SLOPE CLASS	EROSION CLASS	ASPECT	PLOT POSITION	F.F. 2/ DAYS	AVE. PRECIPITATION		NO. OF TREES MEASURED	AVE. SITE INDEX	AVE. SITE INDEX ALL PLOTS	STANDARD DEVIATION	VARIATION COEFFI-CIENT	AVE. HT. OF TREES IN PLOT	AVE. AGE OF TREES IN PLOT	AVE. DIAM. OF TREES IN PLOT
									ANNUAL	GROWING SEASON								
Susquehanna	vfsl	Bradley	9	C	1	SW	Middle	225	52	33	3	73				82	72	16
	vfsl	Bradley	7	E	1	W	Middle	225	51	33	2	74				63	35	13
	vfsl	Bradley	24	F	1	N	Middle	225	52	32	2	79				86	68	16
	vfsl	Cleveland	12	B	1	W	Middle	217	49	31	2	71				76	60	10
	vfsl	Dallas	2	B	1	NW	Middle	217	50	32	2	68				63	44	15
	vfsl	Dallas	14	B	1	E	Middle	217	50	32	2	70				68	47	10
	vfsl	Dallas	12	B	1	S	Middle	217	50	32	2	72				65	38	12
	vfsl	Dallas	1	C	1	W	Middle	217	50	32	2	70				74	59	16
	vfsl	Drew	3	B	1	E	Middle	225	52	33	3	77	73	3	4	84	65	16
Wilcox	sic	Bradley	23	A	1	-	-	225	52	33	2	82				87	62	21
	sic	Bradley	15	A	1	-	-	225	52	33	3	82				86	57	15
	sic	Bradley	16	A	1	-	-	225	52	33	3	83				84	54	15
	sic	Bradley	3	B	1	W	Middle	225	52	33	2	80				83	54	18
	sic	Bradley	21	E	1	E	Middle	225	52	33	2	83	82	1	1	84	52	17
Wrightsville	sicl	Miller	1a	A	1	-	-	233	51	32	4	73	73	-	-	68	43	14
Wrightsville	sil	Lafayette	9	A	1	-	-	223	46	31	2	77				73	44	16
	sil	Lafayette	3	A	1	-	-	223	46	31	2	74				60	32	15
	sil	Miller	13	A	1	-	-	233	51	32	4	70				68	48	13
	sil	Lafayette	16	A	1	-	-	223	46	31	3	81				80	48	16
	sil	Little River	14	A	1	-	-	226	44	29	7	81	77	5	6	81	51	17

1/ Soil type abbreviated. Abbreviations are explained in Table 1 of report.

2/ Frost-free days.

M-2-6-59

APPENDIX B. CRITERIA FOR RATING SOILS

Each soil type and phase listed in Table 1 of report was given a relative rating significant to management for each soil-related woodland conservation item. The criteria established for these relative ratings are discussed individually by woodland items below. These ratings were used to facilitate the assembly of different soils into woodland suitability groupings for use and treatment. Ratings of each group of soil mapping units have been based on all available information -- experience, judgment, knowledge of soils and of woodland conservation problems and on numerous published research studies. The complete rating chart is shown as Appendix Table 3.

Potential soil productivity. The average site index values for each group of soil mapping units (soil types and phases) shown in Table 1 of report were converted to temporary site classes for rating purposes as follows:

Site index range	Site classes by species	
	Shortleaf	Loblolly
106 - 115	-	1
96 - 105	-	2
86 - 95	1	3
76 - 85	2	4
66 - 75	3	5
56 - 65	4	-

These site class ratings appear in Appendix Table 3.

APPENDIX TABLE 3 - RATINGS OF SOIL TYPES IN THE FORESTED COASTAL PLAIN AREA OF ARKANSAS FOR VARIOUS ITEMS IMPORTANT TO WOODLAND USE AND MANAGEMENT

Soil Type 1/	Site Index Classes		Degree of Plant Competition	Equipment Limitations	Seedling Mortality Plantings	Windthrow Hazards	Erosion Hazards
	Shortleaf	Loblolly					
*Almont sil	3	4	2	3	1	2	1
Amite fsl	3	5	2	1	1	1	2
Amite sl	2	4	2	1	1	1	2
Bibb sil	-	3	3	3	1	1	1
Bibb vfsl	-	3	3	3	1	1	1
Boswell fsl	3	4	2	2	1	1	3
Boswell gfsl	3	5	2	2	1	1	3
Bowie fsl	2	4	2	1	1	1	2
Bowie vfsl	2	4	2	1	1	1	2
Bowie sl	2	3	2	1	1	1	2
Bowie lfs	3	4	2	1	2	1	2

1/ Soil type abbreviated - Abbreviations are explained in Table 1 of Report.
* Tentative series.

M-28-59

APPENDIX TABLE 3 - RATINGS OF SOIL TYPES IN THE FORESTED COASTAL PLAIN AREA OF ARKANSAS FOR VARIOUS ITEMS IMPORTANT TO WOODLAND USE AND MANAGEMENT (Cont)

Soil Type 1/	Site Index Classes		Degree of Plant Competition	Equipment Limitations	Seedling Mortality Plantings	Windthrow Hazards	Erosion Hazards
	Shortleaf	Loblolly					
Caddo vfsl	2	4	2	3	1	2	1
Cahaba fsl	2	4	2	1	1	1	2
Dougherty fsl	3	4	2	1	1	1	3
Dougherty vfsl	2	4	2	1	1	1	3
Eustis lfs	2	4	2	1	2	1	3
Eustis ls	3	4	2	1	2	1	3
Iuka fsl	-	3	3	1	1	1	1
Iuka vfsl	-	4	3	1	1	1	1
Iuka sil	-	3	3	1	1	1	1
Izagora vfsl	3	5	2	2	1	1	2
Izagora sil	3	4	2	2	1	1	2
Kalmia fsl	2	4	2	1	1	1	2
Kirvin fsl	2	5	2	2	1	1	3
Lakeland lfs	3	4	2	1	2	1	3
Lakeland ls	3	4	2	1	2	1	3
Leaf fsl	3	4	2	3	1	1	1
Leaf sil	3	4	2	3	1	1	1
Mantachie fsl	-	3	3	3	1	1	1
Mantachie vfsl	-	3	3	3	1	1	1
Mantachie sl	-	3	3	3	1	1	1
Mantachie sil	-	2	3	3	1	1	1
Myatt fsl	3	4	2	3	1	2	1
Myatt vfsl	3	4	2	3	1	2	1
Myatt sil	2	5	2	3	1	2	1
Norfolk fsl	2	4	2	1	1	1	2
Norfolk sl	2	4	2	1	1	1	2
Norfolk lfs	2	4	2	1	2	1	3
Ochlockonee fsl	-	2	3	1	1	1	1
Ochlockonee sil	-	2	3	1	1	1	1
Pheba fsl	3	4	2	2	1	1	1
Pheba vfsl	2	5	2	2	1	1	1
Prentiss fsl	2	4	2	1	1	1	2
Prentiss vfsl	2	4	2	1	1	1	2
*Red Bayou fsl	1	3	2	1	1	1	2
*Red Bayou vfsl	1	3	2	1	1	1	2
Ruston fsl	2	4	2	1	1	1	2
Ruston ls	3	4	2	1	2	1	3
Saffell fsl	3	5	2	1	1	1	2
Saffell gfsl, upper slope phase	3	4	2	1	1	1	2
Saffell gfsl, lower slope phase	2	4	2	1	1	1	2
Savannah fsl	2	4	2	1	1	1	2
Savannah vfsl	3	4	2	1	1	1	2
Sawyer fsl	2	4	2	2	1	1	3

1/ Soil type abbreviated - Abbreviations are explained in Table 1 of Report.
* Tentative series.

M. 28. 59

APPENDIX TABLE 3 - RATINGS OF SOIL TYPES IN THE FORESTED COASTAL PLAIN AREA OF ARKANSAS FOR VARIOUS ITEMS IMPORTANT TO WOODLAND USE AND MANAGEMENT (Cont)

Soil Type 1/	Site Index Classes Short-leaf	Site Index Classes Lob-lolly	Degree of Plant Competition	Equipment Limitations	Seedling Mortality Plantings	Windthrow Hazards	Erosion Hazards
Sawyer vfsl	2	4	2	2	1	1	3
Shubuta fsl	3	4	2	1	1	1	3
Shubuta gfsl	3	4	2	1	1	1	3
Stidham fsl	3	4	2	1	1	1	2
Stough fsl	2	4	2	2	1	1	1
Stough vfsl	3	4	2	2	1	1	1
Susquehanna fsl	3	5	2	2	1	1	3
Susquehanna vfsl	3	5	2	2	1	1	3
Tilden fsl	2	4	2	1	1	1	2
Wilcox sic	3	4	2	2	1	1	2
Wrightsville sil	3	4	2	3	1	2	1
Wrightsville sicl	4	5	2	3	1	2	1
Wrightsville sic	4	5	2	3	1	2	1

Degree of plant competition. This refers to the rate that undesirable species invade different soils (brush encroachment) following removal of tree overstory or when openings are made in the canopy. This is significant to adequate restocking and growth of desired tree species. When classed as severe, desirable species must be released from competing vegetation. Each soil type was rated from 1 to 3 on the basis of increasing hazards due to brush encroachment, transition to less desirable species, undesirable plant competition, etc., after disturbance due to management or fire - assuming other factors to be normal. The specific rating criteria used were:

1. Slight. No special problem is recognized. Kinds of soil are such that invasion by undesirable species will not impede natural regeneration and growth of the designated species.

2. Moderate. A moderate problem is recognized. Competition develops on these soils but will not ordinarily prevent adequate stand establishment of the designated species. Establishment may be delayed and initial growth rate slowed, thereby delaying the development of a normal fully-stocked stand. Site preparation is not essential to the establishment of an adequate stand of the designated species but some simple management techniques can be used to minimize the problem.

3. Severe. A severe problem is recognized. Plant competition is so severe on these soils that natural regeneration cannot be relied upon to provide adequate restocking of designated species. Special management and site preparation treatments are necessary such as controlled burning, using chemical sprays, girdling, tree planting with replanting as needed, etc.

1/ Soil type abbreviated - Abbreviations are explained in Table 1 of Report.

M-28-59

Equipment limitations. This item includes those soil characteristics and topographic features that restrict or prohibit the use of equipment commonly used in crop tending or tree harvesting. Knowledge of these factors may result in different recommendations for kinds of equipment, methods of operation or season of use on different soils. Differences may be due to soil characteristics, stones, drainage, slope or other factors normally used in establishing mapping units. Problems may be seasonal or yearlong. Each soil type was rated from 1 to 3 on the basis of increasing problems. The specific criteria used in rating were:

1. Slight. No special problem is recognized. Kinds of soil are such that equipment use is not restricted in kind or time of year.

2. Moderate. A moderate problem is recognized. Kinds of soil are such that the type of equipment is only moderately limited. There is a seasonal restriction (less than 3 months per year) in use of equipment. Some damage to tree roots may be expected from equipment use on these soils.

3. Severe. A serious problem is recognized. Kinds of soil are such that type of equipment is limited. Equipment use is restricted during a period greater than 3 months per year because of water level or soil moisture. Equipment use will cause serious damage to tree roots and to soil structure and stability.

Seedling mortality of planted seedlings. This item refers to the expected degree of mortality of planted tree seedlings as influenced by kinds of soil. It assumes use of planting stock of proper grade, in a healthy condition when planted, and proper planting. Normal environmental factors, exclusive of soil, are assumed. Each soil type was rated from 1 to 3 using the following specific criteria as a guide:

1. Slight. No special problem is recognized. Ordinary losses expected because of soil influences would not be over 25 percent of planted stock; normally, satisfactory restocking by initial planting can be expected.

2. Moderate. A moderate regeneration problem is recognized. Expected losses of planted stock due to soil influences would ordinarily be between 25 and 50 percent; normally one could expect to do some replanting to fill in openings.

3. Severe. A difficult problem is recognized. Expected losses of planted stock due to soil influences ordinarily are over 50 percent. Considerable replanting, special seedbed preparation, and superior planting techniques are required to assure adequate and immediate restocking.

Windthrow hazard. This item is an evaluation of soil characteristics that control tree root development affecting wind firmness. Information is provided by field observations of wind damage to stands of varying densities on different soils. This evaluation is important in making recommendations by soils for stand density control in thinnings, release cuttings, regeneration and final harvest cuttings. Each soil type was rated from 1 to 3 on the basis of the following criteria:

M-28-59

1. Slight. No special problem is recognized. Kinds of soil where root development of the designated species is normal and exposure to normal wind does not result in problems of windthrow. Individual trees would be expected to remain standing when released on all sides.

2. Moderate. A moderate windthrow hazard is recognized. Kinds of soils where root development of the designated species is adequate for stability except for periods of excessive wetness and during periods of greatest wind velocity.

3. Severe. A serious problem is recognized. Kinds of soils where depth of tree rooting does not give adequate stability. The restriction in rooting depth may be due to water level, a restrictive layer in the soil. Individual trees would be blown over if released on all sides.

Erosion hazard. This item refers to the potential erosion hazard of the soil when the area is not properly managed. Ratings may lead to the development of special recommendations for growing designated species or forest types, adjusting the rotation age and cutting cycles, use of special techniques in management and special attention to road, trail and landing construction and maintenance. Each soil type was rated on the basis of the following criteria:

1. Slight. No special erosion hazard is recognized. Soils occur normally on level and nearly level landscapes.

2. Moderate to severe. Soils occur normally on gentle to moderate slopes and have medium surface textures.

3. Severe to very severe. Soils with very slowly permeable subsurface horizons and with coarse-textured surface horizons on gentle to moderate slopes; or soils that normally occur on steep slopes and escarpments.

M-28-59

APPENDIX C. AVERAGE STAND AND YIELD INFORMATION

Information about average stand and yield of well-stocked, unthinned, naturally occurring shortleaf and loblolly pine has been taken from published reports and organized into Appendix Table 4 for ready reference. This information came from USDA Misc. Publ. 50.

APPENDIX TABLE 4. AVERAGE STAND AND YIELD INFORMATION FOR WELL-STOCKED, UNTHINNED, NATURALLY OCCURRING STANDS. [Data extracted from U.S.D.A. Misc. Publ. 50 (11)].

SHORTLEAF PINE

Site Index	Age	Total Volume Per Acre			Height of Average Dominant Tree	Average Diameter Total Stand 3/	Total Trees Per Acre 3/
	Years	Cu. Ft. Unpeeled 1/	Cords Rough Wood 1/	Bd. Ft. Doyle 2/	Feet	Inches	Number
50	20	-	-	-	25	2.5	3,425
	30	2,040	23	-	35	3.9	1,855
	40	2,980	33	-	44	5.1	1,085
	50	3,970	43	1,600	50	6.1	760
	60	4,430	48	3,200	55	6.9	590
	70	4,780	51	5,050	59	7.6	485
	80	5,050	53	7,000	62	8.3	420
60	20	1,060	12	-	30	2.9	2,520
	30	2,880	32	-	42	4.6	1,370
	40	4,200	46	1,550	52	6.0	815
	50	5,080	54	4,350	60	7.2	570
	60	5,690	60	7,600	66	8.2	445
	70	6,170	65	10,250	71	9.0	370
	80	6,520	68	12,700	74	9.8	315
70	20	1,600	18	-	34	3.5	1,965
	30	3,720	41	750	49	5.4	1,060
	40	5,210	56	4,000	61	7.0	625
	50	6,250	66	8,650	70	8.3	440
	60	7,000	73	12,600	77	9.4	345
	70	7,580	79	16,250	82	10.4	285
	80	8,020	83	19,400	86	11.2	240
80	20	2,190	25	-	39	4.1	1,495
	30	4,420	48	1,950	56	6.2	815
	40	6,100	65	7,650	70	8.0	485
	50	7,380	77	13,550	80	9.5	335
	60	8,250	85	18,850	88	10.8	260
	70	8,920	92	23,450	94	11.9	215
	80	9,460	97	27,550	99	12.9	185

1/ Stand 4 inches diameter breast high and over.
2/ Stand 9 inches diameter breast high and over.
3/ Stand 2 inches diameter breast high and over.

M-28-59

APPENDIX TABLE 4. AVERAGE STAND AND YIELD INFORMATION FOR WELL-STOCKED, UNTHINNED, NATURALLY OCCURRING STANDS. [Data extracted from U.S.D.A. Misc. Publ. 50 (11)]. (Cont)

LOBLOLLY PINE

Site Index	Age	Total Volume Per Acre (Trees 4 inch D.B.H. and Larger)			Height of Average Dominant Tree	Average Diameter, Total Stand	Total Trees Per Acre
	Years	Cu. Ft. (Unpeeled)	Cords (Unpeeled)	Bd. Ft. Doyle	Feet	Inches	Number
60	20	1,500	12	-	32	3.6	1,600
	30	2,750	25	-	45	5.4	850
	40	3,700	35	1,000	54	6.8	585
	50	4,300	41	3,000	60	7.9	440
	60	4,700	46	5,000	64	8.9	360
	70	5,000	49	7,000	67	9.7	310
	80	5,200	51	8,500	69	10.4	275
70	20	1,900	17	-	38	4.3	1,185
	30	3,350	31	1,000	52	6.5	640
	40	4,500	42	3,500	63	8.1	435
	50	5,200	50	6,500	70	9.4	325
	60	5,700	55	10,000	75	10.6	270
	70	6,000	59	12,500	78	11.5	230
	80	6,200	62	15,000	80	12.3	205
80	20	2,350	22	-	43	5.0	950
	30	4,000	38	2,000	59	7.4	510
	40	5,300	51	6,000	72	9.2	345
	50	6,150	60	11,500	80	10.7	255
	60	6,650	66	16,000	85	12.0	210
	70	7,000	70	19,500	89	13.1	185
	80	7,300	73	22,000	92	14.0	160
90	20	2,850	27	-	48	5.6	790
	30	4,700	46	4,000	67	8.2	420
	40	6,200	61	10,000	81	10.2	290
	50	7,200	71	16,500	90	12.0	220
	60	7,800	78	22,000	96	13.4	180
	70	8,200	82	26,000	100	14.6	150
	80	8,550	85	29,000	103	15.6	135
100	20	3,300	32	500	54	6.1	690
	30	5,400	53	6,000	74	9.0	375
	40	7,150	71	14,500	90	11.2	255
	50	8,400	84	23,000	100	13.1	190
	60	9,150	92	29,500	107	14.6	155
	70	9,600	96	33,000	112	15.9	135
	80	9,950	100	35,500	115	17.1	115

1/ Stand 4 inches diameter breast high and over.
2/ Stand 9 inches diameter breast high and over.
3/ Stand 2 inches diameter breast high and over.

M-28-59

APPENDIX D. STATISTICAL ANALYSES OF WOODLAND SUITABILITY GROUPS

Appendix Table 5 shows the statistical significance of the difference between average site index for individually paired woodland suitability groups. It is based on the common variance as calculated in the analysis of variance for each species and is the result of independent computations between each pair of groups.

Appendix Table 6 presents a summary of the analysis of variance of average site index between woodland suitability groupings of soils and individual plots.

APPENDIX TABLE 5. DIFFERENCE IN AVERAGE SITE INDEX BETWEEN WOODLAND SUITABILITY GROUPINGS AND THEIR STATISTICAL SIGNIFICANCE. (Based, for each species, on the mean individual square from an analysis of variance and individual comparisons).

SHORTLEAF PINE

Woodland Suitability Group	Woodland Suitability Group						
	1	2	3	4	5	6	7
1	xxx	7**	10**	12**	12**	16**	26**
2		xxx	3ns	5**	5**	9**	19**
3			xxx	2ns	2ns	6**	16**
4				xxx	0ns	4*	14**
5					xxx	4**	14**
6						xxx	10**
7							xxx

LOBLOLLY PINE

Woodland Suitability Group	Woodland Suitability Group								
	1	2	3	4	5	6	7	8	9
1	xxx	7**	2ns	1ns	1ns	2ns	10**	11**	10**
2		xxx	5ns	6**	8**	9**	17**	18**	17**
3			xxx	1ns	3ns	4*	12**	13**	12**
4				xxx	2ns	3**	9**	12**	11**
5					xxx	1ns	9**	10**	9**
6						xxx	8**	9**	8**
7							xxx	1ns	0ns
8								xxx	1ns
9									xxx

* indicates a significance above the 95 percent level of probability.
** indicates a significance above the 99 percent level of probability.
ns indicates no significance between the two groups.

M-28-59

APPENDIX TABLE 6. ANALYSES OF VARIANCE OF AVERAGE SITE INDEX BETWEEN WOODLAND SUITABILITY GROUPINGS OF SOILS AND INDIVIDUAL PLOTS.

SHORTLEAF PINE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value
Groups	6	1688	281.3	10.7**
Individuals	101	2646	26.2	
Total	107	4334		

LOBLOLLY PINE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value
Groups	8	4506	563.3	25.5**
Individuals	166	3668	22.1	
Total	174	8174		

** Highly significant, above the 99 percent level.

USDA-SCS-FORT WORTH, TEX 1959

M-28-59